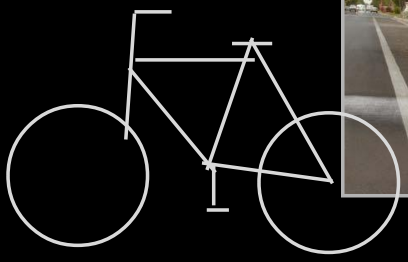
BICYCLE MASTER PLAN



City of Brawley
Bicycle Master Plan

Prepared for the
City of Brawley

Prepared by
WRT
Wallace Roberts & Todd, Inc.
Landscape Architecture / Planning

March 29, 2002

CITY OF BRAWLEY

BICYCLE MASTER PLAN

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DEFINITIONS

AASHTO - American Association of State Highway and Transportation Officials

ADA - The Americans with Disabilities Act (civil rights legislation passed in 1990, effective July 1992).

ADT - Average Daily Traffic - The measurement of the average number of vehicles passing a certain point each day on a highway, road, street, or path.

Arterial (Road) - divided or undivided, relatively continuous routes that primarily serve through traffic, high traffic volumes and long average trip lengths. Traffic movement is of primary importance, with abutting land access of secondary importance.

Bicycle - A vehicle having two tandem wheels, either of which is more than 0.4 m (16 inc.) in diameter, or having three wheels in contact with the ground, any of which is more than 0.4 m (16 inc.) in diameter, propelled solely by human power, upon which any person or persons may ride.

Bicycle Facilities - A general term denoting improvements and provisions made by public agencies to accommodate or encourage bicycling including bicycle paths, bike lanes, parking and storage facilities, lockers and showers, maps of bikeways, marked routes and shared roadways not specifically designated for bicycle use.

Bicycle Lane (Class II) - A portion of a roadway (typically 1.2-1.5 m.) which has been designated by signing and pavement markings for the preferential or exclusive use by bicyclists.

Bicycle Path (Class I) – A separated paved or hard surface (typically 2.4 m.) that serves the exclusive use of bicycles and pedestrians.

Bicycle Route (Class III) - A system of roadways that is linked by signs that designates the roadway as a route for bicyclists, generally providing a preferred route.

Bikeway - Any road, path, or bikeway which, in some manner, is specifically designated as open to bicycle travel, regardless of whether such facility is designated for the exclusive use of bicycles or is to be shared with other transportation modes.

Clearance, Lateral - The width required for safe passage of a bicyclist as measured in a horizontal plane.

Clearance, Vertical - The height necessary for the safe passage of bicyclists as measured in a vertical plane.

Collector (Road) - A road designated to carry traffic between local streets and arterials, or from local street to local street.

Edge Line - A painted or applied line to designate the edge of the road (typically 150-200 mm, 6-8 inches wide).

Enhancement funds - Under TEA 21, set aside funds for twelve categories of projects including bicycling and pedestrian facilities and trails.

ISTEA - Intermodal Surface Transportation Efficiency Act enacted in1991. Federal legislation guiding the expenditure of federal highway funds for bicycle, pedestrian, and other improvements.

Lateral Clearance - The distance between the edge of a roadway or bikeway and a fixed object. Also, the separation distance a roadway user needs to feel safe operating near a fixed object.

Shared Roadway - Any roadway upon which a bicycle lane is not designated and which may be legally used by bicycles regardless of whether such facility is specifically designated as a bikeway.

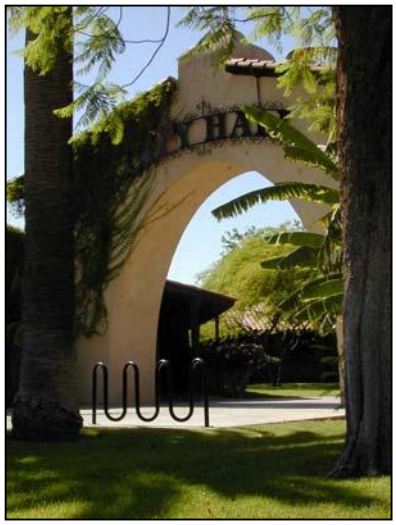
Shoulder (Paved) - Portion of highway or roadway that is contiguous to the traffic lanes to allow access for emergency vehicles, bicyclists, and where designated, pedestrians.

Staging Area - A designated area at a beginning of a trail or bikeway that is established for the use and comfort of trail users. Generally, it will include parking areas and other amenities such as, restrooms, sign kiosks, waste receptacles, picnic tables, benches and water fountains.

CHAPTER 1 EXECUTIVE SUMMARY

A. Significant Findings

The City of Brawley, located in the center of Imperial Valley, is surrounded by lush agriculture fields and a system of water filled aqueducts *(Figure 1.0)*. State highways 111, 86, and 78 intersect Brawley connecting to Palm Springs, Baja Mexico and to Interstate 8. San Diego is a short two-hour, 126-mile drive to the west. This compact city covers approx. 5.6 square miles and serves a population of approx. 22,052 (U.S. Census 2000).



Brawley City Hall

Brawley's sunny and dry temperatures attract tourists and visitors who enjoy the temperate year-round climate. Imperial Valley experiences clear skies, very low humidity, averaging 28% in the summer to 52% in the winter, extremely hot summers, mild winters, and little rainfall. The flat terrain and sunny climate offer ideal conditions for cycling during from October to May. School children regularly bike to school which is evident by the full bicycle racks at the local schools.

The City of Brawley's General Plan, Circulation Element and Open Space Element, provide a series of goals and policies supporting the preparation of a Bicycle Master Plan. The purpose of this plan is to identify key destination areas and determine where appropriate facilities should be located so that once the bicycle network is complete; cyclists will be provided with a comprehensive, well-connected bicycle facilities system. Additionally, a well-designed bicycle network will allow the City to pursue state and federal funding programs for implementation.

Participants at a public workshop held on July 3, 2001 reviewed a system of proposed bicycle routes presented at the workshop. Based on information and public comment received at the workshop, the proposed bicycle system was revised to address those comments directed a providing bicyclists with access to schools and parks.

B. Major Recommendations

Although the City of Brawley has a number of well-used bicycle lanes, these lanes are interspersed throughout the City and do not provide connectivity to key destination areas such as schools, parks, and employment centers. Existing bicycle lanes are located along S. Rio Vista Avenue, N. Western Avenue, S. Imperial Avenue, a short segment of N. 7th Street, B Street and N. Eastern Avenue. Most of the existing bicycle lanes should be restriped. The bike lane along S. Rio Vista Avenue since it is used primarily as parking for residences and should be designated as a Class III bicycle route.

The Bicycle Master Plan (Figure 3.0) recommends implementation of a 24.21 mile system of bicycle routes that will provide a network of bicycle lanes/routes that connect to the schools, parks and the city center. The recommended bikeway network is a mixture of Class I bicycle path (separated pathway around Pat Williams Park), Class II bicycle lanes (lane within the roadway), Class III bicycle routes (designated bicycle routes). The estimated cost to implement the bikeway system is $511,200, which includes the improvements to Pat Williams Park and Cattle Call Park. The bicycle facility around Cattle Call Park is recommended as a Class II bicycle route to allow for the use of vehicles during the Cattle Call Rodeo activities whereas bikeway improvements to Pat Williams Park would be comprised of a multi-use trail around the park.

Bicyclist along D Street

This Bicycle Master Plan outlines the planning criteria and descriptions of each proposed bikeway route by type. The bikeway system will be implemented over time, as funding opportunities become available through grant programs or through implementation of roadway improvements or regular roadway maintenance. The ultimate system is designed to meet the needs of cyclists as Brawley grows.

Upon adoption of this Bicycle Master Plan, it is recommended that the plan be reviewed every four years to determine if it should be modified to reflect changing conditions. Public workshops are also recommended to provide input on possible changes. A public point of contact should be established at the City to coordinate public concern and/ or comments, to identify and support Public Works improvement projects, and to provide a basis for pursuing grant funds.

CHAPTER 2 INTRODUCTION

A. Purpose

The primary purpose of the Brawley Bicycle Master Plan is to identify a system of bicycle routes that will serve as a tool for planning future bicycle facilities and roadway improvements. This plan is intended to provide a fair assessment of bicycle needs, planning opportunities, bicycle routes, implementation costs, and funding opportunities. Although the City's 1995 General Plan recognizes the need for alternative transportation modes, a comprehensive bicycle plan has not been formulated. Preparation of the Master Plan is identified as a component in the Implementation Program of the General Plan. The Bicycle Master Plan reassesses the existing bicycle network, provides recommendations for improving bicycle facilities and develops a priority list for implementation.

An effective bikeway system can increase opportunities for commuting, reduce traffic, expand recreation facilities, improve air quality, enhance personal health, and increase tourism. This plan recommends a system of bicycle routes that will connect existing and developing residential areas to destination points for both commuter and recreation bicyclists. The City should use this plan as a tool when planning future roadway facilities, improvements to existing roadways, scheduling capital improvements, and applying for grant funds for bikeway facilities.

Additionally, this plan responds to the provisions of the California Bikeways Act, which defines specific requirements to be included in a Bicycle Master Plan. A Bicycle Master Plan or Bicycle Transportation Plan must comply with the program guidelines as set forth in Section 890-894.2 of the Streets and Highways Code (Appendix D) in order to be eligible for Bicycle Transportation Account grant funds for construction of bicycle facilities.

In order to comply with the requirements of California Department of Transportation, (Caltrans), the Bicycle Transportation Plan or the Bicycle Master Plan must include the following elements:

1. A needs assessment of the estimated number of existing and future bicyclists in the project area,
2. A map and description of existing and proposed land uses and existing and proposed bikeways, destination points, parking facilities, support facilities,
3. A description of bicycle safety and education programs,
4. A community participation program,
5. A discussion of how the plan is consistent with other plans,
6. A description of each project proposed in the plan and a priority list for implementation, and

7. A description of past expenditures for bicycle facilities and future financial needs for projects that will improve safety and convenience for bicycle commuters.

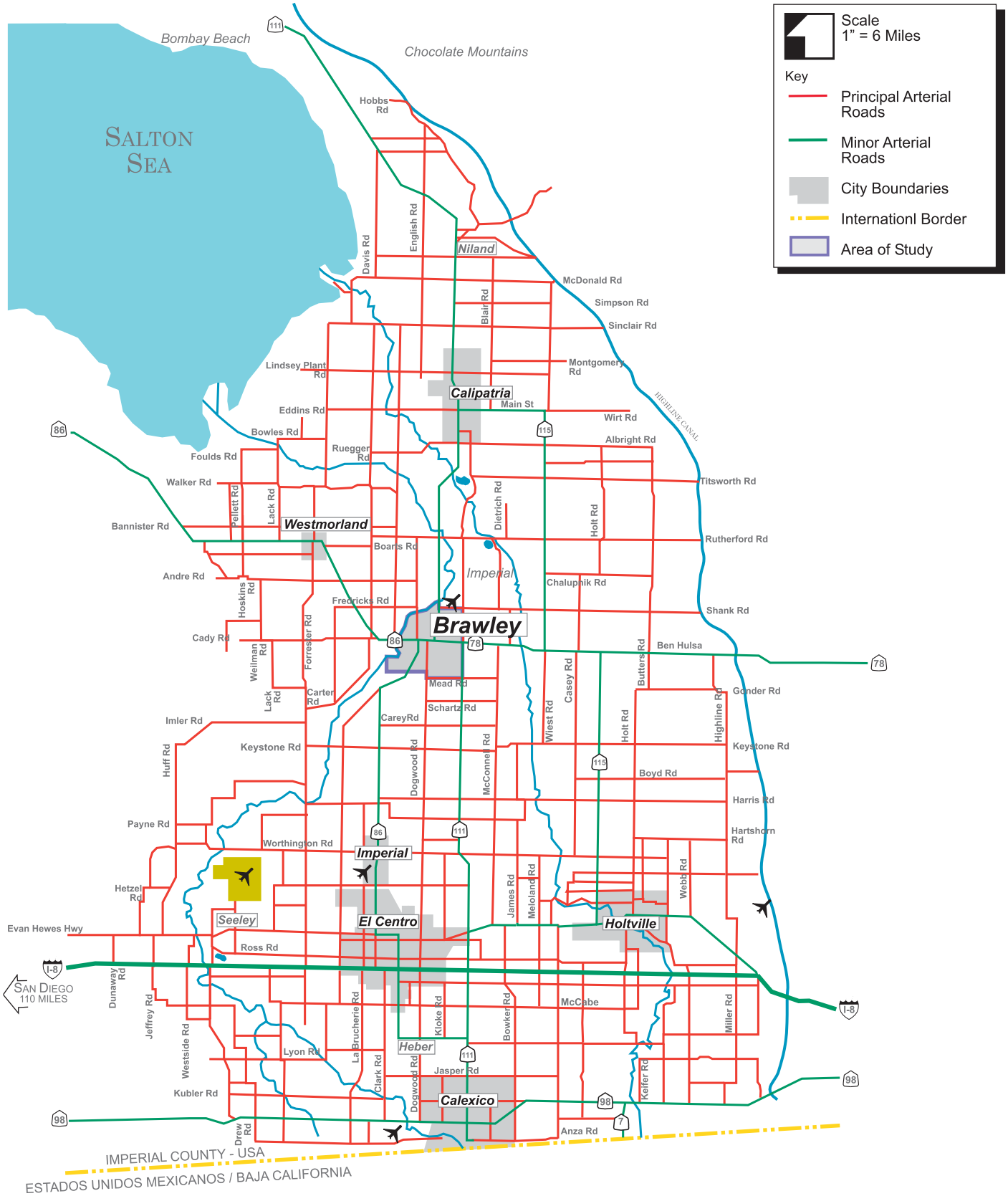
B. Project Study Area

As the third largest city in Imperial County, the City of Brawley is located in the center of the Imperial Valley, surrounded by lush agriculture fields and a system of water filled aqueducts *(Figure 1.0).* State highways 111, 86, and 78 intersect Brawley and the Southern Pacific Railroad extends north-south through the city. Mexico's border is 30 miles to the south and San Diego is 126 miles to the west (*Figure 2.0)*.

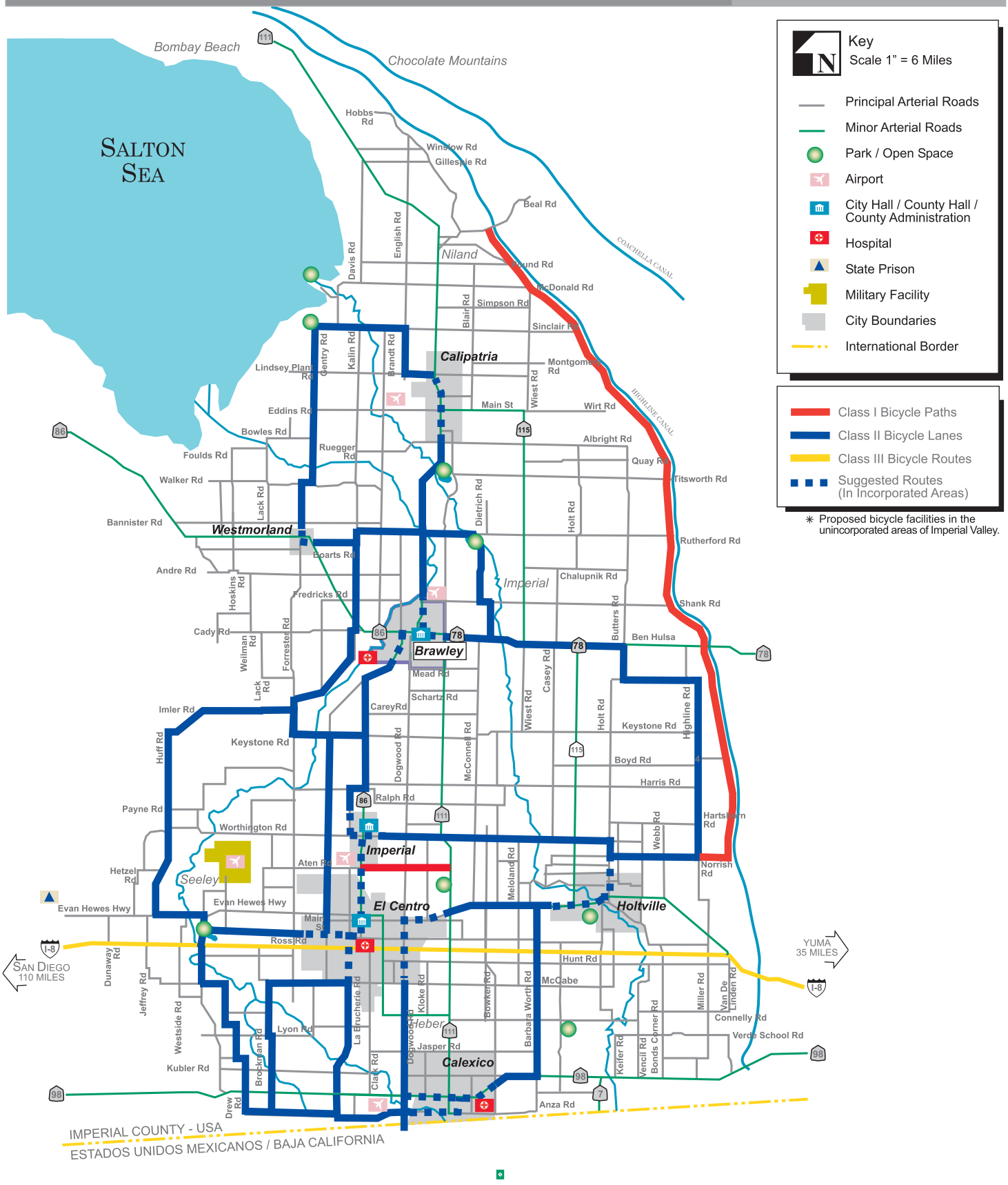
Brawley covers approx. 5.6 square miles and serves a population of approx. 22,052 (U.S. Census 2000) with an expected growth rate of 2% per year. The number of employed population is 10,244 (DOF estimate 2000). The median household income is $22,365, which makes cycling an economical transportation alternative.

Brawley's sunny and dry temperatures attract tourists and visitors who enjoy the temperate climate avoiding the harsh winters in northern climates. While the city experiences extremely hot summers, the months from October through May offer clear skies and low humidity and together with flat terrain the conditions are ideal for cycling.

Existing bicycle lanes are located along S. Rio Vista Avenue, N. Western Avenue, S. Imperial Avenue, a short segment of N. 7th Street, B Street and N. Eastern Avenue. General funds and Caltrans grants and funding have been used in the past to install bicycle lanes on a number of the roadways.


Scale
1" = 6 Miles
Key
Principal Arterial Roads
Minor Arterial Roads
City Boundaries
Internationl Border
Area of Study
Bombay Beach
Chocolate Mountains
SALTON SEA
Hobbs Rd
English Rd
Davis Rd
Niland
McDonald Rd
Simpson Rd
Sinclair Rd
Blair Rd
Lindsey Plant Rd
Montgomery Rd
Calipatria
Main St
Wirt Rd
Albright Rd
HIGHLINE CANAL
Eddins Rd
Bowles Rd
Ruegger Rd
Foulds Rd
Walker Rd
Pellett Rd
Lack Rd
Titsworth Rd
Bannister Rd
Westmorland
Dietrich Rd
Holt Rd
Rutherford Rd
Boarts Rd
Andre Rd
Hoskins Rd
Imperial
Chaluplnik Rd
Fredricks Rd
Shank Rd
Brawley
Cady Rd
Forrester Rd
Wellman Rd
Ben Hulsa
Butters Rd
Casey Rd
Mead Rd
Carter Rd
Lack Rd
Gander Rd
Highline Rd
Imler Rd
CareyRd
Schartz Rd
Wiest Rd
Keystone Rd
Huff Rd
Dogwood Rd
McConnel Rd
Boyd Rd
Harris Rd
Payne Rd
Hartshorn Rd
Worthington Rd
Imperial
Webb Rd
Hetzel Rd
James Rd
Meloland Rd
Seeley
El Centro
Holtville
Evan Hewes Hwy
Ross Rd
I-8
SAN DIEGO
110 MILES
Dunaway Rd
Jeffrey Rd
Westside Rd
Lyon Rd
La Brucherie Rd
Clark Rd
Kloke Rd
Heber
Bowker Rd
McCabe
Miller Rd
Jasper Rd
Kubler Rd
Dogwood Rd
Calexico
Keifer Rd
Drew Rd
Anza Rd
IMPERIAL COUNTY - USA
ESTADOS UNIDOS MEXICANOS / BAJA CALIFORNIA

Proposed Regional Bicycle Facilities*



Land Use

Main Street (Highway 78) is bordered by several high-density residential developments that include students, elderly and families without vehicles. These residences are within close proximity to the high concentration of retail, entertainment, civic, and community services located along Main Street as well as bus routes. The residential community is generally within a block or two of the commercial district along Main Street allowing an easy commute to work and services

Brawley has an abundance of active parkland with 14 parks totaling more than 120 acres. With an average of 6 acres of parkland per 1,000 people, the City boasts the highest park acreage per number of residents in Southern California. Brawley still retains the pioneering spirit of its early residents with a weeklong celebration held during November including the Cattle Call Rodeo, one of the largest sanctioned, professional rodeo events in California.

The City supports four elementary schools, two junior high schools and one high school with a student population over 5,480 (pp. 7, Housing Element, April 2001). The majority of the students at each of these schools lives within 2 miles of the school and primarily walks, bikes or takes the bus to school. Of the 3,825 students in grade kindergarten through eighth grade, approximately 5% arrive to school by car, whereas, approximately 25% of the high school student population arrive to school by car.

Employment

The retail/entertainment corridor provides a large employment base for local residents with an average commute of five minutes (Brawley Economic Development Commission, 6/01/01). Situated amidst one of the most productive farmlands in the world, producing vegetables, hay, alfalfa, and dairy products, one of the largest employers is understandably agriculture production firms. The Holly Sugar Company employs 350 persons and other agriculture processing is with a short distance. Other large employers include the Calipatria State Prison to the north, with over 1,000 employees, regional government facilities in El Centro to the south, geothermal power facilities located northwest of the City and other manufacturing employers including Golds Fields Operating Company and the U.S. Gypsum Company. With the recent addition of an international, commercial border crossing east of Calexico, additional development in Imperial Valley resulting from NAFTA opportunities is anticipated (Figure 3.0).

COMMUNITY FACILITIES

1. National Guard Armory
2. Police Station
3. Sheriff Station
4. Library, City Hall, Post Office
5. D.M.V.
6. Public Works
7. Water Works

SCHOOLS & PARKS

- Ⓐ Desert Valley High School
- Ⓑ Brawley Union High School
- Ⓒ Barbara Worth Jr. High School
- Ⓓ Myron D. Witter Grammar School
- Ⓔ Miguel Hidalgo Grammar School
- Ⓕ Alyce Park
- Ⓖ Oakley Grammar School & Ridge Park
- Ⓗ Phil D. Swing Grammar School
- Ⓘ Lions Field & Rec. Center
- Ⓙ Abe Gonzales Park
- Ⓚ Meserve Park
- Ⓛ Plaza Park
- Ⓜ Hinojosa Park
- Ⓝ Guadalupe Park
- Ⓞ Jeffrey A. Thorton Park
- Ⓟ Cattle Call Park
- Ⓠ Pat Williams Park
- Ⓡ Imperial Valley College, External Campus Center

LEGEND

- Schools
- Parks / Open Space
- Commercial/Industrial
- Hospital / Medical Centers
- Community Facilities
- Existing Bike Lane
- Southern Pacific Railway
- City Boundary
- Bike Routes Proposed in the Imperial County Bicyle Master Plan

N

0 0.25 0.5 0.75 1 Mile

C. Historical Context

Brawley has a colorful history that had its start around the turn of the twentieth century when water was allocated to the Central Valley of Imperial County in response to the concept that the valley could support agriculture. J.H. Braley of Los Angeles, California had underwritten 4,000 shares of water stock and was assigned 4,000 acres of land. Disappointed when the U.S. Government released a circular citing that nothing would grow in the Imperial Valley region even with plentiful water, J. H. Braley sold the title of the land to George E. Carter at $16.50 an acre. The land was then sold to the Imperial Land Company, which then who establishing a water supply for agriculture. Once agriculture was established and the railroad came to town, growth was inevitable. The first public school opened with six pupils and by September 1903 the town has grown to fifteen-businesses and fifty families. In spite of J.H. Braley's insistence that the town not be named after him, the City of Brawley incorporated in June 1908. Today, Brawley is the center of the greatest proven producing area in the United States, a claim sustained by its annual record of produce shipments.

As a salute to the cattle industry, then the largest agricultural enterprise in the region, the City purchased land near the river and built a rodeo in 1956. The Cattle Call Rodeo entertains more than 50,000 each November with its rodeo events as well as a Bluegrass Festival, Chili Cook-Off, and Grand Parade. Despite growth in population and increasing diversity of the economy, Brawley retains the small-town, old west flavor that has given it such wide appeal.

D. Citizen and Community Involvement

An important goal of this Master Plan is to develop a plan that meets the needs of the community. In order to encourage public input, the City of Brawley conducted a public workshop on July 3, 2001 during the City Council Meeting at the Lion's Field Recreation Center. Public comment was received on various components of the proposed bicycle transportation plan. The Council suggested that the Class I bicycle path proposed around Cattle Call Park be reduced to a Class III bicycle route since the access road would be used for vehicles during the rodeo. Attendees at the workshop stated that they felt that there is a definite need to provide bicycle facilities to city parks and schools.

City Council Workshop

E. Relationship to General Plan and Other Plans

The Bicycle Master Plan represents an implementation tool of the City's General Plan. The General Plan, completed in January 1995, identifies key goals and objectives supporting and encouraging the development of bicycle facilities. Stated in the General Plan are the following goals and policies, which support the development of this Bicycle Master Plan.

General Plan – Infrastructure Element Implementation

Infrastructure Element (pp. 8)
"Alternate methods (modes) of transportation for people, such as walking, bicycles, or public transportation (buses, vans), may reduce dependency on automobiles."

Infrastructure Goals and Policies (pp. 10-11)

Goal 1: *Provide a system of streets that meets the needs of current and future inhabitants and facilitates the safe and efficient movement of people and goods.*

Policy 1.2: Develop and implement circulation system standards for roadway and intersection classifications, right-of-way width, pavement width, design speed, capacity, maximum grades and associated features such as medians and bicycle lanes or trails that are adjacent or off-road.

Policy 1.11: Encourage new development which facilitates transit services, provides for non-vehicular circulation and minimizes vehicle miles traveled.

Policy 1.12: Minimize pedestrian and vehicular conflicts through street design and well-marked pedestrian crossings.

Circulation Element (pp. 18, Item 20, Implementation Program, pp. 19, item 21)
Alternative Transportation Modes:

Goal: *The City will promote the use of alternative transportation modes to reduce automobile use and for recreational purposes through the following actions:*

- Provide uniform standards and practices for the safety of pedestrians and bicyclists by providing adequate sidewalks, bicycle lanes, and off-road trails. Require dedication and improvement of these facilities where deemed necessary to meet public needs arising as a result of developments;

- Provide pedestrian ramps at intersections to accommodate wheelchairs, strollers, bicycles, and other wheeled vehicles. Include pedestrian ramps in all new street facilities. Where pedestrian ramps do not currently exist, construct such facilities in concert with the construction of other street improvements, (e.g. street widening, new traffic signals, new drainage facilities);

- Consider using right-of-ways along flood channels, irrigation canals, utility lines, and streets for pedestrian, bicycle, and equestrian trail; and
- Prepare and implement a bicycle trail plan that links to the Open Space designated in the Brawley Land Use Plans and planned and established County bicycle trails; and

- Encourage safe biking by supporting safety clinics in coordination with Brawley Unified School District.

Transit, Bicycle, pedestrian, and equestrian facilities (pp. 29-30),

Goal: *Adequate transit service and bicycle, pedestrian, and equestrian facilities are an important component of growing cities. These transportation modes provide an alternative to automobile use and consequently reduce both local and regional traffic congestion, and air pollution.*

Many of Brawley's residential streets provide excellent opportunities for bicycle travel due to relatively low traffic levels and wide street widths. As new development occurs in the city and roadway construction and improvements occur, additional bicycle facilities should be provided through the provision of bicycle paths and bicycle lanes on existing roadways.

Bicycle paths may provide an opportunity for recreational bicyclists and should be considered in connections with parks and other recreational facilities. Bicycle lanes on city streets generally serve bicyclists who are commuters or who ride as a means of alternative transportation.

Substantial open space is designated in the Land Use Plan. The City will provide trails for bicyclists, pedestrians, and equestrian uses in natural areas and future parks. Construction of such pathways would enhance the recreational opportunities available in Brawley. In addition, right-of-ways along flood control channels, irrigation canals, utility lines, and streets can provide land for bicycles, pedestrians, and equestrian trails and are consistent with the Implementation Program of the General Plan (pp. 20).

Resource Management Element (pp. 9, 19)

Goal 1: *Reduce air pollution through proper land use, transportation and energy use planning.*

Policy 1.5 Provide commercial areas that are conducive to pedestrian and bicyclist circulation.

Policy 1.7 Create the maximum possible opportunities for bicycles as an alternative transportation mode and recreational use.

Goal 2: *Improve air quality by influencing transportation at choices of mode, time of day, or whether to travel.*

Policy 2.5 Encourage non-motorized transportation through the provision of bicycle and pedestrian pathways.

Open Space/Recreation Element Implementation (pp. 10)

Goal 4: *Encourage the development and maintenance of a balanced system of public and private parks and recreation facilities that serves the needs of existing and future residents in the City of Brawley.*

Policy 4.9: Evaluate and, where feasible, utilize the opportunities offered by abandoned roads, railroad right-of-ways, and similar environmentally impacted or unused linear open spaces for low-maintenance greenbelts and multi-use trails.

Policy 4.10: Strive to provide Brawley with a full range of recreational opportunities that reflect the community's current and future population size and demographic character.

General Plan - Open Space Element Goals and Objectives (pp. 38)
An integrated open space plan for the City shall be prepared that includes:

- The City's parklands, landscaped medians and parkways in City streets, bicycle and pedestrian trail systems, and active and passive open space;
- An assessment of the open space and recreational opportunities offered by abandoned road and railroad rights-of-way, and similar environmentally impacted or unused linear open space;
- Phasing schedule for commitment of resources including the design and construction of facilities; and

- Using the development review process to ensure installation of trail systems and other complementary facilities, and connection of private open space with the City's comprehensive system of open space in residential, commercial, and industrial development.

F. Consistency with Other Adopted Plans

The Bicycle Master Plan is consistent with the Bicycle Master Plans for the County of Imperial and the City of El Centro. The County of Imperial adopted the first Bicycle Master Plan for the region with several other cities following suit. As each of the City in the valley develops and adopts their own Bicycle Master Plan, there may be a need to update and revise the County's Bicycle Master Plan to take into consideration additional routes recommended by the individual cities.

CHAPTER 3 GOALS AND OBJECTIVES

The primary purposes of the Bicycle Master Plan is to increase bicycling activities which in turn provides health benefits, improves air quality, and reduces traffic. The potential for increasing the number of bicycle trips has been documented by a National Personal Transportation Survey conducted by the Federal Highway Administration (1992) which shows that ¼ of all trips are less than one mile, 40% are two miles or less and almost half are 3 miles or less. Approximately 53% of all people live less than 2 miles from the nearest public transportation route.

Residential neighborhoods, retail centers, and schools are all within cycling distance in Brawley. The provisions of the Intermodal Surface Transportation Efficiency Act (ISTEA) encourage alternative transportation modes by offering grant funds for implementation. Through this program, public awareness of the benefits of cycling was renewed. Cycling is therefore a reasonable approach to achieve alternative transportation, personal health, and air quality goals.

A. Key Goals

The following goals have guided the preparation of this report and the recommended bikeway network:

1. A comprehensive, rational and equitable bikeway system connecting residential neighborhoods with parks, schools, city hall, and existing and future employment.

2. School and commuter bikeways that are easily recognized and accessible from residential areas.

3. Bicycle storage facilities and/or bicycle racks for new parks, retail, and employment centers.

4. Bikeways integrated with roadway improvements and/or new construction projects based on the recommended bikeway network.

B. Key Objectives

Realizing the key goals may be best accomplished by setting out key objectives or strategies for implementing the bikeway network. Objectives of the Brawley bicycle network are:

1. Plan, design, and construct roadways that include facilities for bicyclists.

2. Encourage cycling by planning accordingly when developing new schools, parks, and residential communities.

3. Integrate bicycle facilities as part of the design and construction of new roadways and upgrade of existing roadways.

4. Establish a bicycle network that offers facilities for all ages and physical abilities.

5. Encourage educational programs that promote the safe and efficient travel of cyclists.

6. Provide for bicycle access to employment, commercial, and other transportation and travel destinations.

7. Improve the existing bikeway network by restriping existing bicycle lanes that are consistent with the recommended routes.

8. Remove bicycle lanes along roadways that are in conflict with on-street parking and requires unsafe maneuvering around parked vehicles.

9. Develop guidelines and/or standards for bicycle parking with new commercial and industrial development.

10. Pursue grant funding programs for implementing the bikeway network.

11. Identify a key contact person who coordinates and implements the bikeway system.

CHAPTER 4 BIKEWAY DEMAND AND BENEFITS

A. Demand for bicycle facilities

Bicycling is one of the most popular forms of recreational activity in the United States, with 46% of Americans bicycling for pleasure. Generally, the demand for bikeways is predicated by the number of cyclists evident on roadways, the number of bike-related accidents, and public opinion or requests for new bikeways. However, establishing bicycle facilities as the city continues to grow will encourage cycling for pleasure and for commuting to work, school, or shopping.

Bicycling is a convenient and economical form of transportation. The income level of Brawley's residents is $22,365 with an average family size of 3.71 (U.S. Census 2000) well above the statewide average of 2.5 persons per household. Population growth in Brawley has risen steadily from 19,243 residents in 1990 to 22,065 residents in 2000 (U.S. Census 2000). Employment is primarily agricultural comprising approximately 18.8 percent of the total employment (or 1,200) of the city. Additional employment located within the City includes the Pioneer Memorial Hospital, Imperial Valley College, the civic center, and retail/commercial are all within a short cycling distance of residential neighborhoods.

Bicyclists form a highly diverse group of individuals whose cycling preferences and cycling skill is varied. The levels of cyclists are typically classified as advanced, basic, and inexperienced (including children). These categories are described below:

> *Advanced cyclists* are highly experienced cyclists who ride frequently, are confident in cycling with motorized traffic, and can negotiate with less operating space. These cyclists generally range in age from 20 – 50+ years, representing 20% of all cyclists but accounting for an estimated 80% of all bicycle trips. They are comfortable traveling long distances, are accustomed to cycling in a variety of environments and will most likely choose to bicycle for commuting or shopping.
>
> *Basic bicyclists* are more casual riders, are less comfortable in traffic and have limited experience and skills. They form the largest group of bicyclists, but cycle occasionally and account for the largest group ranging in age from 9 years old to 50+ and are both male and female.

> *Inexperienced cyclists and children* form a separate group of bicycle riders. Children have minimal riding skill, little experience, limited physical capability, and are not comfortable riding with traffic or within the roadway. These cyclists lack confidence and judgement regarding safe cycling practices. Sidewalks, school grounds, parks, and Class I bicycle paths generally provide safe environments for the young riders.

Generally, when planning for bicycle facilities, various levels of bicyclist's abilities are considered in relation to the community and environment in which they live and cycle. Advanced cyclists are best served by bicycle *compatible roadways* designed to accommodate shared use by bicycles and vehicles. Basic riders are more comfortable with *designated roadways* with bicycle facilities that encourage bicycle use.

A *compatible roadway* is one which features design features that allow a competent bicyclist to safety share the roadway with a vehicle. Design features may include traffic volumes, speeds and environmental setting and signage. Typically, this facility is a Class III bicycle route.

A *designated roadway* is one that encourages cycling through the use of lane markings and signage. Typically, this facility is a Class II bicycle lane. Other considerations of a designated roadway may include traffic conditions, appropriate width and geometrics, and directness of route. A Class I bicycle path is recommended for those inexperienced cyclists since it is separated from the road and motorized traffic.

In Brawley and elsewhere in Imperial Valley, experienced cyclists frequently travel on wide roadways with shoulders that are not designated as truck routes. The experience level of cyclists in Brawley falls into the basic cyclists and inexperienced or younger cyclists categories. The Phasing Plan identified in Chapter 6 is would provide bicycle facilities for students and commuters with the intent of making bicycling an integral component of the community.

The latent "need" for bikeways are those cyclists that would cycle if bikeways were available. This latent need is difficult to quantify and requires reliance on evaluating other comparable communities to determine potential usage. During the months of August, September and October of 2000, surveys conducted by the Bureau of Transportation Statistics (BTS) identified that one in five adults reported using a bicycle in the last 30 days. The BTS also found that 7% or 2.9 million persons commute to work. Bicycle usage may increase if there are more bicycle facilities. A recent study (March 2001) released by the Association of Pedestrian and Bicycle Professionals "states that 79% of voters felt bicycle trails and lanes are important to creating safe communities."

Using the 1990 U.S. census, "Journey to Work" data and the 2000 U.S. census population data, it can be estimated that almost 1.5% (154) of all employed Brawley residents (10,244) commute primarily by bicycle. This does not include those who ride to work less than 50% of the time, nor does it always include those who may walk or ride to transit and list "transit" as their primary mode.

Nationally, the mean travel time for bicycle and pedestrian commuters was 14.2 minutes, which translates roughly into a commute distance of about 3.5 miles for bicyclists or a 7-mile round trip. This data can be used to estimate the potential reduction in the number of vehicle miles if cycling is increased.

A detailed summary of bicycle demand and benefits for the City of Brawley is shown below in Table 1. It is assumed that once the facilities are constructed within Brawley and connecting routes are constructed by the County of Imperial and within the surrounding cities of Calipatria, Imperial, and Westmorland, more cyclists would conduct loop cycle trips between the cities or enjoy long distance rides in the Valley. The average American household makes 2,321 trips by car every year. "Forty percent of these trips are made within two miles of our homes." (*Outside*, Jan. 2000, "The Hard Way" by Mark Jenkins). As bikeways are constructed in Brawley, short distance vehicle trips are anticipated to be reduced.

The U.S. Department of Transportation publication entitled "National Walking and Bicycling Study" (1995) sets as a national goal to double current walking and bicycling mode shares by the year 2010, assuming that a comprehensive bicycle and pedestrian system is in place. This would translate into a commuter bicycle mode share of 3% or 358 commuters in Brawley. Add to this number, the number of commuters who bike occasionally and students who bike to schools, and the average number of daily bicyclists in Brawley increases to an estimated 1,052 bicycle commuters by the year 2010. These bicyclists will be saving an estimated 141,000 vehicle trips and 987,000 vehicle miles per year.

TABLE 1.0 DEMOGRAPHICS AND BICYCLE TRANSPORTATION	
Population (U.S. Census 2000)	22,065
Estimated County Resident who would like to Bicycle for Pleasure *(National estimate of 46%)*	10,150
Current Bicycle Commute Mode share *(1.5% of adults 18-65 – 11,931 U.S. Census 2000)*	179
Future Bicycle Commute Mode Share *(US DOT goal of 3% to double commuting by 2010)*	358
School-related bicycle commuters (20% of 7-14 year olds – 3,470)	694
Total future bicycle commuters *(employed + student commuters)*	1,052
Reduced Vehicle Trips/Year	141,000
Reduced Vehicle Miles/Year	987,000
Reduced PM10/lbs./Year *(.0184 tons per reduced mile)*	18,161
Reduced NOX/lbs.Year *(.04988 tons per reduced mile)*	49,232
Reduced ROG/lbs./Year *(.0726 tons per reduced mile)*	71,656

1. Assume a 7 mile average round trip and an average of 200 commute days/year bike/walk commute for adult commuters and 100 commute days/year for students.

Commuter Needs

Most of Brawley's residents are employed locally, in agriculture (producing, packaging, or distribution), in government services at the Calipatria State Prison or the Imperial Valley government center in El Centro, and at the geothermal plants northwest of the city. Many of the agricultural jobs are seasonal. However since the opening of the Calipatria State Prison in 1992, proximity of the geothermal power plants, and expanding urban services, year round employment is expanding.

Bus service is provided by Imperial Transit with a route that connects El Centro to Niland passing through the cities of Imperial, Brawley, Westmorland and Calipatria. Bus stops are located at the Pioneer Memorial Hospital, 5th and K Streets, and Main and 2nd Streets. Bicycle racks on the buses are scheduled for installation in 2001.

In order to accommodate bicyclists that would like to commute to work, the City should consider adopting standards for bicycling parking for new commercial and industrial development. The recommended provision is to require 5% of the automobile parking requirement of over 15 spaces shall be designated for bicycle parking. Each inverted-U bicycle rack counts as two bicycle parking spaces. (Reference City of Denver Municipal Code Section 59-582(e)).

Student Needs

Within the City boundaries, there are parks, community pools, the Civic Center, four elementary schools, two Junior High Schools, one high school, fourteen parks and one hospital, as reflected on *Figure 1.3*. The City has a higher than average younger population compared with the rest of California. The 1990 Census showed the median age of population at 29.7 years of age. Children under the age of 19 comprise 37.5% and ages between19 - 64 comprise 52.8%, of the population (U.S. Census 2000).

Cycling to school can reduce the number of vehicle trips, as all of the schools and the fourteen city parks are located within residential neighborhoods. The estimated enrollment of the 4 elementary schools, 1 junior high school and 2 high school is over 5,480 (pp. 7, Housing Element, April 2001). In February 2000, the City conducted a survey on the numbers of students who bicycle to school. The following indicates the school, the number of students and the estimated number of cyclists:

School	Students	Bicyclists
Phil Swing Elementary School	837 students	26 bicyclists
Myron D. Witter Elementary School	718 students	2 bicyclists
Miguel Hidalgo Elementary School	688 students	7 bicyclists
Oakley Grammar School	757 students	2 bicyclists
Barbara Worth Junior High School	825 students	10 bicyclists
Brawley Union High School	1,503 students	5 bicyclists
Desert Valley High School	620 students	2 bicyclists
Total	5,480 students	54 bicyclists

Site surveys of the number of bicyclists at each school were conducted in May 2001. These surveys indicate a higher ratio of cyclists at Phil Swing Elementary School and Barbara Worth Junior High School with approximately 45 bicyclists at each school. Based on this information, the total number of estimated student bicyclists is 108. This results in an estimated student cycling population of approximately 2%.

Recreation Needs

Growth in non-motorized travel typically entails development of systems of facilities, including appropriately designed roads and traffic systems, separated bicycle paths and trails, provision of safe and secure parking at destinations, transit systems which accommodate bicyclists, and – perhaps most importantly – the development of information, education and enforcement policies and programs which encourage bicycle use within that community. With over fourteen parks within the city, providing connection to these facilities will enhance the overall recreational amenities of the city.

B. Accident/Safety Analysis

A review of bicycle-related accidents reported in Brawley reveals that in the first 6 months of 2000 there were 8 bike related accidents. Prior year accident data reflects 9 accidents (1 fatal) in 1999, 11 accidents in 1998, 8 accidents in 1997 and 8 accidents in 1996. With 3 major roadways bisecting the city, safety is a major concern as future bikeways are planned. Avoidance of these major roadways is desirable however, the majority of the commercial services are located along Main Street (SR 78).

In discussing bicycle safety, it is important to separate perceived dangers from actual safety hazards. Bicycle riding in cities is commonly perceived as at least semi-dangerous because of the exposure of a lightweight, two-wheeled vehicle trying to negotiate safely between automobiles, trucks, buses, and pedestrians. In Brawley perceived safety hazard is associated with truck movement and high traffic volumes along Main Street exceeding 20,000 ADTs (average daily trips) and along 8th Street at 23,400 ADTs (1999, Caltrans, District 11).

In fact, bicyclists face only a marginally higher chance of sustaining an injury than motorists based on the numbers of users and miles traveled. Much of the perception of danger comes from motorists who have to veer into an opposing lane of traffic to pass a bicyclist(s) or who must slow down in order to accommodate a bicyclist(s) in the lane of traffic.

Some apparent dangers of cycling may be reduced by conducting regular bicycle safety programs, which may be offered by the Police Department at local schools. Currently, no bicycle safety programs are being conducted locally. It is evident by the numbers of bicycles at the bike racks of the local schools that many children bike to school. An education program aimed at students to promote the use of wearing helmets and bicycle safety would reduce the potential for severe accidents.

Theft and vandalism may be an issue for cyclists who bike to parks, schools, and employment centers. The lack of bike racks at parks, employment centers, and retail areas makes it difficult for cyclists to commute to work or shopping. Bicycle racks are located at City's parks and schools. Other retail and employment areas may consider adding bicycle racks or lockers to encourage bicycling.

C. Air Quality Analysis and Health Benefits

Air Quality

Imperial Valley is located within the Southeast Desert Air Basin (SEDAB). Exposure to air pollutants has a serious effect on health. Particulate matter is a good indicator of the air pollution mix that people are exposed to and has been associated with short term and long term increases in mortality. People exposed to particulate matter have higher risks of respiratory symptoms, greater use of drugs for asthma, and respiratory and cardiovascular disease. Air pollution monitoring stations controlled by the Air Pollution Control District are located in Brawley, El Centro, and Calexico. These stations determine if the county is meeting the national air quality standards.

Several studies have linked proximity to busy roads and heavy goods vehicles (mostly with diesel engines) with respiratory problems. (Occupational Environmental Medicine, 1998 and Epidemiology 1997). Car users have been shown to breathe more air pollutants than walkers, cyclists, or people using public transport on the same road due air pollutants breathed in congested traffic, at drive-thru restaurants and banks, and at intersections.

The California Clean Air Act (CCAA) of 1988 requires that all areas of the state achieve and maintain ambient air quality standards. The Air Quality Attainment Plan for Imperial prepared by the Imperial County Air Pollution Control District in 1991 is designed to meet these requirements. Installing bicycle facilities will encourage bicycling and thereby reduce the use of vehicles. The combined benefit of an estimated future bicycle commuters in Brawley over the next 20 years is improved air quality based on an annual reduction of about 18,161 lbs. of particulate matter in the air (PM10), and a reduction of 49,232 lbs. of NOx, and 71,656 lbs. of ROG (See Table 1, page 24).

Health Benefits

The benefits of cycling and walking are frequently overlooked. Cycling or walking can bring major health benefits. A half an hour a day can reduce the risk of developing heart disease by half. More people are at risk of coronary heart disease due to physical inactivity than any other single risk factor. Low to moderate levels of exercise, such as bicycling can also reduce hypertension, obesity, diabetes, osteoporosis, and depression. As important as measurable health benefits, there are also the benefits of improved mental outlook and enhanced well-being that is associated with physical activity and recreation.

The health and recreational benefits of bicycling can contribute to an increased demand for recreational bicycling facilities for those who regularly migrate to the Imperial Valley for winter residence. Such demand would likely be for separated

facilities such as bike paths or trails. Favorable year-round weather combined with available and safe facilities would increase the numbers of active seniors who bicycle periodically, although statistical verification of this is difficult to establish at this time.

D. Education

An education program which promotes the advantages of cycling and explains how to cycle effectively and defensively are key to improving cycling in the community. Safety education programs should target cyclists of all ages and motorists as well. Emphasis should focus on the rules of the road, riding on the street, advantages to using helmets, using lights at night, and selecting appropriate routes for cycling.

It has been noted (The National Bicycle and Walking Study, pp. 16) that as more cyclists are evident on roadways, vehicles are more apt to expect and watch for cyclists. Making bicycling and walking more viable and attractive relies on the "four E's" of cycling as defined by the Federal Highway Administration: **E**ngineering, **E**ducation, **E**nforcement and **E**ncouragement. Each must be optimized into a cohesive strategy to make cycling a reality to the community.

The city may consider conducting a regular bicycle safety program at the local schools. Awareness efforts could include distributing bikeway maps that not only locates bicycle routes, facilities, bicycle racks, and staging areas, but also offers bicycle safety tips. Other cities have been successful in putting bicycle safety messages on bus billboards, bus benches, park and recreation brochures, local street maps, bumper stickers, school bulletin boards, radio shows, traffic signs, library bulletin boards, and trail kiosks.

Awareness of cyclists serves as an educational component for the safety of cyclists. Promoting annual "Bike-to-Work" Week encourages commuting to work and more importantly recognizes and promotes cycling as a true form of transportation.

The City's General Plan Implementation Program recommends that the City encourage safety clinics in coordination with the Brawley School District. Other education programs need to be pursued by the City to inform cyclists of safe cycling practices. The "Safe Routes to School Program" was approved the State in 1999 and extended in 2001 which sets aside funds for bicycle safety education and implementation of bicycle facilities.

CHAPTER 5 BICYCLE DESIGN GUIDELINES AND STANDARDS

Bicyclists are entitled to travel on all roads except those that are lawfully prohibited to them (Cal. Veh. Code § 21200). Many motorists do not know that legally, bicyclists on conventional roadways are never required to use a separated path or even a shoulder. There are many cyclists who prefer cycling in the lane of traffic. Like motorists, bicyclists want to reach their destinations safely, conveniently, and with minimum delay. Frequently, bicycle paths are not direct or continuous and are shared with pedestrians. Each community is comprised of cyclists of different abilities and those who desire different types of facilities. Each community should offer facilities that meet these varied needs.

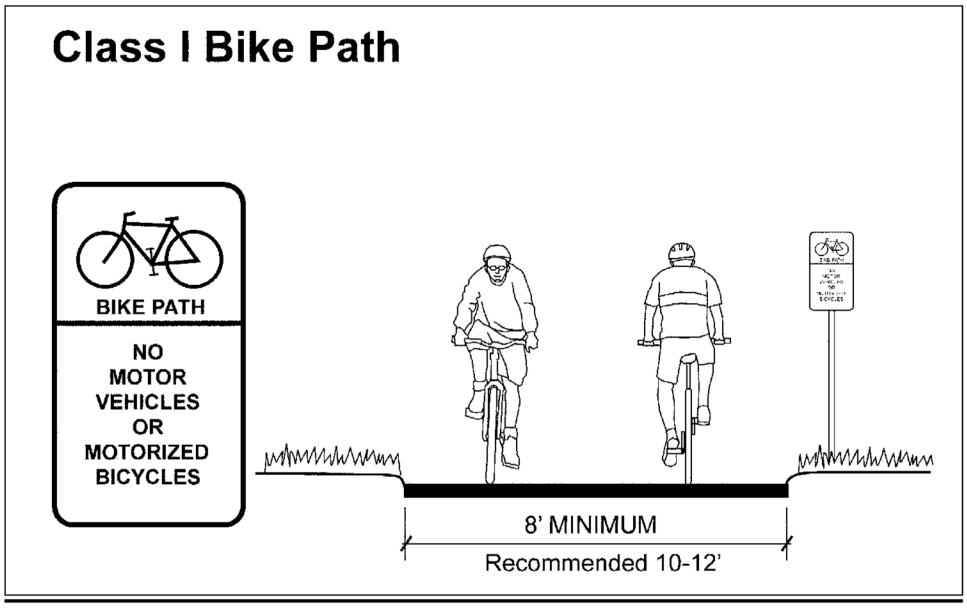
A. Classifications

All new bikeways should meet or exceed Caltrans guidelines as described in "Chapter 1000, Bikeway Planning and Design" found in Appendix D. Planning of bikeways should concentrate on providing the highest level of safety for bicyclists and motorists alike. The three categories of bicycle facilities are Class I bikeways, Class II bicycle lanes and Class III bicycle routes and are more specifically described below:

Class I - Bikeways

Class I bikeways are facilities where exclusive right of way with cross-vehicular traffic is minimized. Class I bikeways serve the exclusive use of bicycles and pedestrians. The minimum paved width for a two way bike path shall be 2.4 m. (8 ft.). The minimum paved width for a one way bike path shall be 1.5 m. (5 ft.). A bicycle path is not a sidewalk but may be designated a multi-use to permit shared use with pedestrians, rollerbladers, and/or skateboarders.

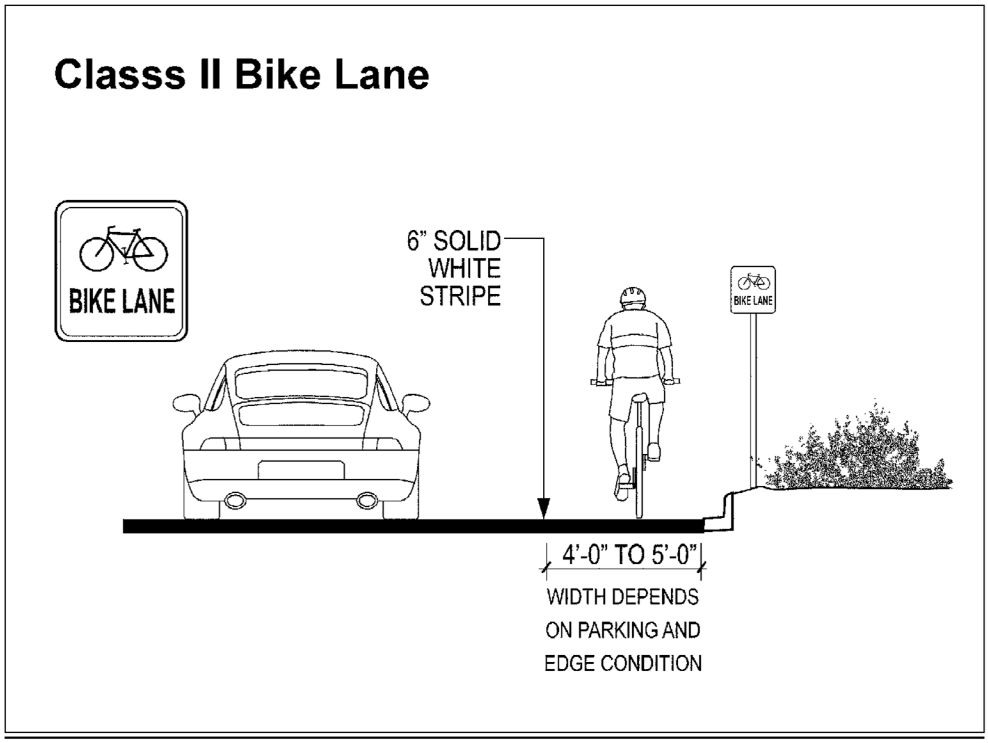
It is recommended that along Class I bikeways landscaping be drought tolerant and low maintenance species. The use or preservation of native materials, especially along riparian habitats, is recommended.



Class II - Bicycle Lanes

Class II bikeways (bike lanes) for preferential use by bicycles is established within the paved area of highways through identifiable pavement striping or markings ad signage.

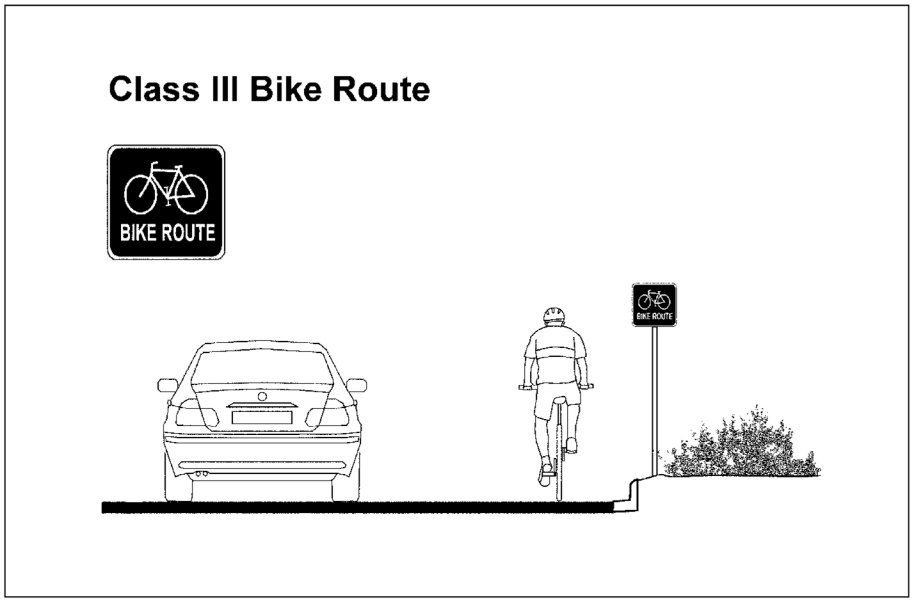
Caltrans recommends that in the case of rural highways used by intercity and recreational travel that a 1.2 m. (4 ft.) paved roadway shoulders with a standard 100 mm. (4 in.) edge stripe be developed and maintained to improve the safety and convenience for bicyclists and motorists (Section 1002.4(1)).



Class III - Bicycle Routes

Class III bikeways (bike routes) are intended to provide continuity to the bikeway system. Bike routes are established along through routes not served by Class I or II bikeways, or to connect discontinuous segments of bikeway (normally bike lanes)

Class III facilities are shared facilities, either with motor vehicles on the street or with pedestrians on sidewalks. In either case bicycle usage is secondary. Class III facilities are established by placing bike route signs along roadways.



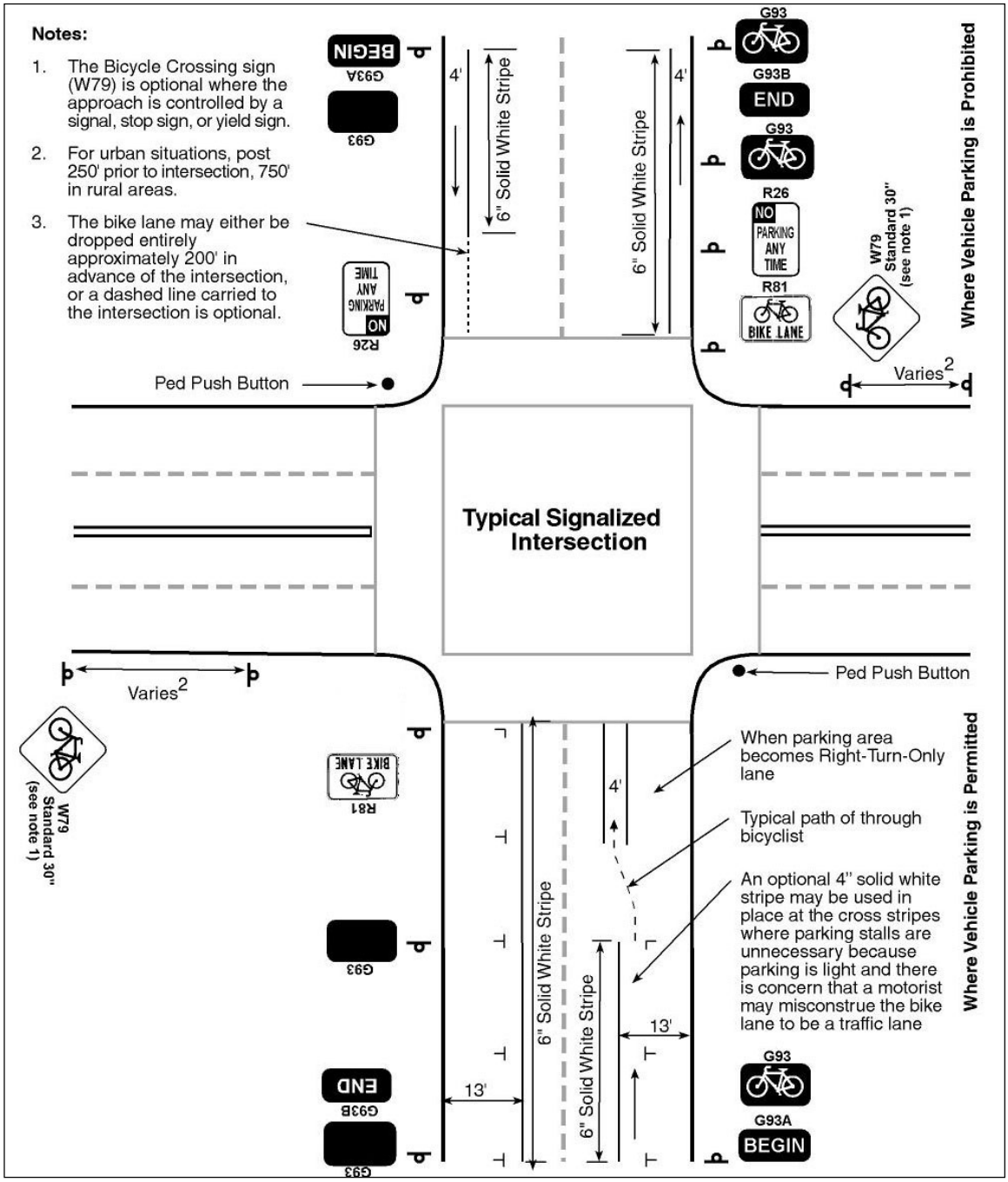
B. Bikeway Signage

Many standard roadway signs, such as speed limit and warning signs, apply to both motorists and bicyclists. In addition to those, Caltrans guidelines (see Appendix) require that bikeways include standard signs and pavement markings as shown.

Standard regulatory, warning, and guide signs used on highways may be used on bike paths, as appropriate.

The R3-17 bike lane sign shall be placed at the beginning of all bike lanes, on the far side of every arterial street intersection, at all major changes in direction, and at maximum 1-km intervals. Bike routes are established through placement of the G93 bike route sign. Bike route signs are to be placed periodically along the route.

In order to create continuity and identity of the bicycle system, a comprehensive sign program utilizes an identifiable logo or City seal that may be attached to the bike signs. This identifiable logo can help build support, recognition and awareness of the bikeway system and increase the number of cyclists. This identity would be used on all bikeway signage, brochures, and other materials. The logo will help define the bikeway routes as a cohesive system rather than a series of disconnected routes. A City-wide numbering system may also be used that would identify bikeways to enable cyclists to plan a route or note where support facilities are located.


Notes:
1. The Bicycle Crossing sign (W79) is optional where the approach is controlled by a signal, stop sign, or yield sign.
2. For urban situations, post 250' prior to intersection, 750' in rural areas.
3. The bike lane may either be dropped entirely approximately 200' in advance of the intersection, or a dashed line carried to the intersection is optional.
BEGIN
G93A
G93
4'
6" Solid White Stripe
6" Solid White Stripe
4'
G93
G93B
END
G93
R26
NO PARKING ANY TIME
R81
BIKE LANE
W79 Standard 30" (see note 1)
Where Vehicle Parking is Prohibited
R26
NO PARKING ANY TIME
Ped Push Button
Varies2
Typical Signalized Intersection
Varies2
Ped Push Button
W79 Standard 30" (see note 1)
R81
BIKE LANE
When parking area becomes Right-Turn-Only lane
Typical path of through bicyclist
An optional 4" solid white stripe may be used in place at the cross stripes where parking stalls are unnecessary because parking is light and there is concern that a motorist may misconstrue the bike lane to be a traffic lane
4'
6" Solid White Stripe
6" Solid White Stripe
13'
13'
G93
G93A
BEGIN
END
G93B
G93
Where Vehicle Parking is Permitted

C. Support Facilities

Support facilities and programs are an important part of the Brawley Bikeway Master Plan. Bike racks are located at each of the schools and parks. Other major areas of employment should be consider installing bike racks. Lack of bike racks and other facilities are frequently mentioned by bicyclists and would-be bicyclists as reasons why they don't ride or ride less often. Bike racks should be located at each school and at shopping areas in excess of 50,000 square feet or where it is evident of high cycling use.

Bicycle Rack

The city should adopt bicycle parking standards for future commercial and industrial development. Typical standards are one bicycle rack (10 bicycles) per 40 elementary and junior high schools students, per 100 high school students, and per 100 employees. The number of racks needed at each location can be determined when the existing rack begins to exceed 80% capacity. The type of rack should be based on a) costs, b) ease of use, and c) ability to prevent theft.

Bicycle Shelter

The criteria for locating bike racks on public property are based on experience and planning. Bike racks should be located so as not pose a safety hazard to pedestrians nor should they be located in areas of poor lighting or visibility.

Due to the high costs of bicycle lockers and the difficulty to maintain them, bicycle lockers are often not used. Bicycle storage lockers may be considered at transit stations or major employment locations where the lockers are internal and are maintained by the employer.

Other support facilities may include staging (parking) areas at key locations where it is anticipated to have a high usage or if the facility is located a long distance from where cyclists may start their rides. These staging areas may include a number of other amenities including:

- Bike racks
- Shade shelters
- Seating
- Signage (interpretative and directional)
- Lighting
- Trash receptacles
- Emergency telephones
- Portable restrooms
- Water fountains (with bottle spouts and dog basins)

There are areas that may not require a complete staging area, but would serve the cyclists by providing some of the amenities. Bike racks at schools, employment centers, and parks not only encourage cycling, but also discourage vandalism. Class I bike paths frequently have added support facilities such as lighting, signing, water fountains, and interpretative signing since the number of users are frequently higher than a roadway and the type of users include not only cyclists, but pedestrians, disabled persons, and roller bladers. Loop detectors which are calibrated to detect bicycles should be provided at signalized intersections with bikeways as part of roadway expansion or reconstruction projects where bikeways are identified in the plan.

CHAPTER 6 BIKEWAY PLAN

A. Route Selection

The choice of whether the bicycle facility should be a Class I, II, or III is dependent on many factors. Bicycle travel is permitted on most streets and highways without bikeway designations, however it may be desirable to place a bike route (Class III) designations on those roadways. In areas of limited width and high traffic volumes or speeds, the use of the roadway may be unacceptable to most cyclists creating a perception of decreased safety.

Roadways which could easily accommodate Class II bike lanes by signing and striping and minor improvements were considered for bike lanes. Improvements such as additional asphalt paving, striping and signing would improve roadway conditions for bicyclists. Additional considerations were given to routes that include roadways which connect to schools, employment centers, and/or parks.

Opportunities for Class I bicycle paths exists along the system of canals operated by the Imperial Irrigation District that supplies irrigation water throughout the county. Formal biking trails and coordinated management of these trails could reduce unauthorized fishing and hazards posed by the canals. These separated bikeways would provide an opportunity for all ages and abilities to bike, walk, roller blade, and/or use a wheelchair along a scenic corridor.

Based on the key goals, information collected during the public workshop, and upon conducting visual site surveys, a system of proposed bikeway routes were developed. Some general principles should guide the bicycle facilities planning process:

1. Every street is a bicycling street and all locations accessible to a motor vehicle should be accessible by bike.
2. All appropriate agencies and general public should be involved in the planning process.
3. Transportation plans should overcome existing barriers to bicycle travel and create no new barriers.
4. Roadway improvements should provide access to all destinations through the most direct or feasible route.
5. The plan should remain flexible and anticipate changes to the system.

The bikeway system is a system of planned routes that is based on the following criteria:

1. Directness to schools, employment centers, or attractions.
2. Roadway conditions

3. Traffic volumes and speeds
4. Continuity
5. Access
6. Attractiveness
7. Security
8. Elimination of barriers that restrict bicycle travel
9. Delays
10. Conflicts

Field review revealed that although there are a number of opportunities for cycling, the key problem area is cycling on the major roadways that experience high volumes of truck traffic. These roadways include Main Street, Imperial Avenue, Malan Street, Best Canal Road, and SR 86.

Bicycling throughout the city can be easily achievable once a comprehensive network is installed. Brawley is a compact city (5.6 square miles) where employment and services are a short distance from residential neighborhoods; there is little traffic on the residential roadways; the roadways are generally 60 – 80' wide allowing for the movement of two way traffic and the addition of bicycle lanes; and a widely dispersed park system throughout the city.

B. Proposed Bikeway System

The following describes the proposed Brawley Bikeway System including descriptions of each proposed route. The proposed 24.21 mile bikeway system consists of 23.51 miles of bicycle lanes and routes and .70 mile of a Class I bicycle path around Pat Williams Park. (Figure 3.0).

Bicycle Route Selection

The Brawley bicycle system was based on public input at the public workshop held on July 3, 2001, consultation with staff, and site review. The criteria for selecting a specific route was based on the following:

1. Coverage - The system should provide equitable, reasonable access from all portions of Brawley for commuting to employment, schools, and recreation routes.

2. System Rationale - Each route in the system should serve a definitive purpose (recreation connection, or commuting) so that users will understand and use the facilities.

3. Regional Bike System - The bikeway system should have good connections to existing and proposed bikeways in the adjacent cities and provide potential routes to schools and employment centers within the cities.

Loop Systems - Recreation bikeway loops should be provided so that cyclists can ride without having to cross major roadways or double back to their destination.

The following describes the proposed Brawley Bikeway System including descriptions of each proposed segment (Figure 4.0).

Segment 1: River Drive (Pat Williams Park access)

Description:

The Class III bicycle route from N. Rio Vista Drive to Pat Williams Park would require improvements to the roadway. An asphalt concrete road with curb and gutter would be installed and signed as a Class III bikeway.

***Mileage and Cost**:*

The total length is 0.2 miles and the estimated cost to construct is $110,000.

Segment 2: Flammang Ave.

Description:

The Class III bicycle route would be located along the roadway with a right of way of 65'.

***Mileage and Cost**:*

The total length is 0.58 miles and the estimated cost to construct is $2,900.

Segment 3: Phil Swing Grammar School

Description:

The Class II bicycle lanes would be located within the 72' right of way west of Rio Vista Drive and 63' east of Rio Vista Drive. The bicycle lanes would connect from N. Rio Vista Drive to Warne Park and Weist Fields. This portion of the bicycle lanes would be developed as part of the Parkside Subdivision.

***Mileage and Cost**:*

The total length of the two segments is 0.81 miles and the estimated cost to construct is $4,050 based on installing lanes as part of the roadway improvements.

Segment 4: A Street

Description:

The Class II bicycle lanes route would be located within the roadway right of way of 75' that connects with Brawley Union High School and the Recreation Center. Improvements include signing and striping.

***Mileage and Cost**:*

The total length is 0.74 miles and the estimated cost to construct is $3,700.

Segment 5: B Street

Description:

The Class II bike lane would be retained within the 81' roadway right of way which connects to Brawley Union High School and Oakley Grammar School.

***Mileage and Cost**:*

The total length is 0.78 miles and the estimated cost for restriping and installing new signs is $3,900.

Segment 6: C Street

Description:

The Class II bike lane would be located within the 81' road right of way and would connect to Barbara Worth Junior High School. Improvements include striping and installing Class II bikeway signs.

***Mileage and Cost**:*

The total length is 0.26 miles and the estimated cost to construct is $1,300.

Segment 7: D Street

Description:

The Class II bike lane would be located within the 84' road right of way of 84' and would connect to Barbara Worth Jr. High School. Improvements include striping and installing Class II bikeway signs.

***Mileage and Cost**:*

The total length is 0.70 miles and the estimated cost to construct is $3,500.

Segment 8: E Street

Description:

The Class II bike lane would be located within the 79' road right of way and would parallel the Barbara Worth Junior High School and connect to the library, city hall, and post office. Improvements include striping and installing Class II bikeway signs.

***Mileage and Cost**:*

The total length is 0.34 miles and the estimated cost to construct is $1,700.

Segment 9: H Street

Description:

The Class II bike lane would be located within the 86' road right of way paralleling Hinojosa Park. Improvements include striping and installing Class II bikeway signs.

***Mileage and Cost**:*

The total length is 0.16 miles and the estimated cost to construct is $800.

Segment 10: I Street

Description:

The Class II bike lane would be located within the road right of way and parallel Hinojosa Park. Improvements include striping and installing Class II bikeway signs.

***Mileage and Cost**:*

The total length is 0.17 miles and the estimated cost to construct is $850.

Segment 11: K Street

Description:

The Class III bike route would be located within the road right of way of 77' that connects with Witter Grammar School, Meserve Park, and Miguel Hidalgo Grammar School. Improvements include installing Class III Bicycle Route signs.

***Mileage and Cost**:*

The total length is 1.75 miles and the estimated cost to construct is $1,750.

Segment 12: Cattle Call Drive

Description:

The Class III bike lane would require widening of the roadway and installing Class I bicycle lane signs. Cattle Call Drive serves as the primary entrance to Cattle Call Park.

***Mileage and Cost**:*

The total length is 0.27 miles and the estimated cost to construct is $17,550.

Segment 13: Malan Street

Description:

The Class III bike route would be located with the 69' road right of way and would connect to Witter Grammar School, Miguel Hidalgo Grammar School, and Guadalupe Park. Portions of Malan Street serve as a truck access to downtown Brawley. Improvements include installing Class III Bicycle Route signs.

***Mileage and Cost**:*

The total length is 2.02 miles and the estimated cost to construct is $2,020.

Segment 14: Panno Street/Calle Estrella, Avenida del Valle and Richard Avenue

Description:

The Class III bike route would be located within the 60' road right of way. Although a segment of the road widens to 100', there is not enough right of way for the majority of the road with 2-way vehicle lanes and on street parking. This route would provide access to Jeff Thornton Park and Pioneer Memorial Hospital. Improvements include installing Class III Bicycle Route signs.

***Mileage and Cost**:*

The total length is 1.17 miles and the estimated cost to construct is $1,170.

Segment 15: American Legion Road

Description:

The Class III bike route would be located within the varying roadway width from 37' to 65'. The bike route would provide a bike facility to Pioneer Memorial Hospital and connects with Jeff Thorton Park. Improvements include installing Class III Bicycle Route signs.

***Mileage and Cost**:*

The total length is 0.24 miles and the estimated cost to construct is $240.

Segment 16: Willard Avenue

Description:

The Class II bike lane would be located within the future 64' road right of way and would connect to the City's Public Works Yard and the entrance to Cattle Call Park. Improvements include installation of bicycle lane striping and installing Class II Bicycle Lane signs.

***Mileage and Cost**:*

The total length is 0.43 miles and the estimated cost to construct is $2,150.

Segment 17: Rio Vista Avenue

Description:

The Class III bike route would be located within the 65' road right of way. An existing bicycle lane would need to be removed due to on-street residential parking conflicting with the bicycle lane. The bike route connects to Williams Park.

***Mileage and Cost**:*

The total length is 1.09 miles and the estimated cost to construct is $3,270 ($1,000 per mile for bicycle route signs and $2,000 per mile to remove the existing bicycle lane striping).

Segment 18: Highway 86 and Western Avenue

Description:

The Class II bike lane would be located within the roadway width varying from 109' to 85' right of way. The bike lanes provide an entrance to the City from El Centro and connect to Phil Swing Grammar School. Improvements include installing bike lane striping and Class II Bicycle Lane signs.

***Mileage and Cost**:*

The total length is 2.51 miles and the estimated cost to construct is $12,550.

Segment 19: 1st Street and 2nd Street

Description:

The Class II bike lane would be located on the northbound of 1st Street and the southbound of 2nd Street between K and Malan Street. Improvements include installing bike lane striping and Class II Bicycle Lane signs.

***Mileage and Cost**:*
The total length is 0.25 miles and the estimated cost to construct is $1,250.

Segment 20: North and South Plaza Street

Description:
The Class II bike lane with a right of way of 100' that connects to the Library, City Hall, Post Office, Plaza Park, and Barbara Worth Junior High School. This particular pathway is also located at the center of the city and connects with the major vehicular routes that bisects the City. Improvements include installing bike lane striping and Class II Bicycle Lane signs.
***Mileage and Cost**:*
The total length is 0.44 miles and the estimated cost to construct is $8,800.

Segment 21: North and South Imperial Avenue

Description:
The Class II bike lane would be located within the 95' road right of way. There is an existing bike lane along this corridor that connects to Brawley Union High School, Barbara Worth Junior High School, library, post office, city hall, and Plaza Park at the City's center.
***Mileage and Cost**:*
The total length is 1.48 miles and to restripe and install new bike lane signs for the corridor at an estimated cost of $7,400.

Segment 22: North 7th Street

Description:
The Class II bike lane would be located within the 72' road right of way and would connect to Brawley Union High School. Improvements include installing bike lane striping and Class II Bicycle Lane signs.
***Mileage and Cost**:*
The total length is 0.08 miles and the estimated cost to construct is $400.

Segment 23: North 8th Street

Description:
The Class II bike lane would be located within the 78' road right of way. Improvements include installing bike lane striping and Class II Bicycle Lane signs.
***Mileage and Cost**:*
The total length is 0.24 miles and the estimated cost to construct is $1,200.

Segment 24: Highway 78/111/Main Street

Description:

The pathway is a Class III bike route with a right of way of approximately 78' that serves as a main route through the City. Improvements include installing Class III Bicycle Route signs.

***Mileage and Cost**:*

The total length is 0.57 miles and the estimated cost to construct is $2,850.

Segment 25: South 9th Street

Description:

The Class II bike lane would be located within the 87' road right of way and would pass by Hinojosa Park. Improvements include installing bike lane striping and Class II Bicycle Lane signs.

***Mileage and Cost**:*

The total length is 0.24 miles and the estimated cost to construct is $1,200.

Segment 26: Cesar Chevaz

Description:

The Class II bike lane would be located within the 78' road right of way and would connect to Hinjosa Park and Miguel Hidalgo Grammar School. Improvements include installing bike lane striping and Class II Bicycle Lane signs.

***Mileage and Cost**:*

The total length is 0.68 miles and the estimated cost to construct is $3,400.

Segment 27: North and South Palm Avenue

Description:

The Class II bike lane would be located within the 81' road right of way and would connect to the Department of Motor Vehicles, Oakley Grammar School, and Alice Gereaux Park. Improvements include installing bike lane striping and Class II Bicycle Lane signs.

***Mileage and Cost**:*

The total length is 1.06 miles and the estimated cost to construct is $5,300.

Segment 28: North and South Eastern Avenue

Description:

A Class II bike lane is currently located within the 60' road right of way and would connect to Oakley Grammar School. Improvements include installing bike lane striping and Class II Bicycle Lane signs.

***Mileage and Cost**:*

The total length is 0.66 miles and the estimated cost to restripe and add new bicycle lane signs would be $3,300.

Segment 29: Best Canal Rd. / Highway 111

Description:

The Class II bike lane would be located within the 72' road right of way. A stoplight is programmed for installation by Caltrans in mid 2002. Estimated costs are based on installing bike lane striping and Class II Bicycle Lane signs. The City may consider placing a flashing light at the intersection of Malan Street and State Highway 111 to alert traffic of crossing bicyclists.

***Mileage and Cost**:*

The total length is 2.5 miles and the estimated cost to construct is $50,000.

Segment 30: Pat Williams Park

Description:

An existing dirt path currently exists around the park and is used by equestrians. The improvements consist of formalizing the existing meandering pathway with an asphalt-paved pathway edged with concrete headers. Landscaping improvements also include installing trees and irrigation. A 5' minimum width of the dirt pathway would remain for equestrians.

Path around Pat Williams Park

Mileage and Cost:

The total length is .70 miles with an estimated cost of $82,000.

Segment 30: Cattle Call Park

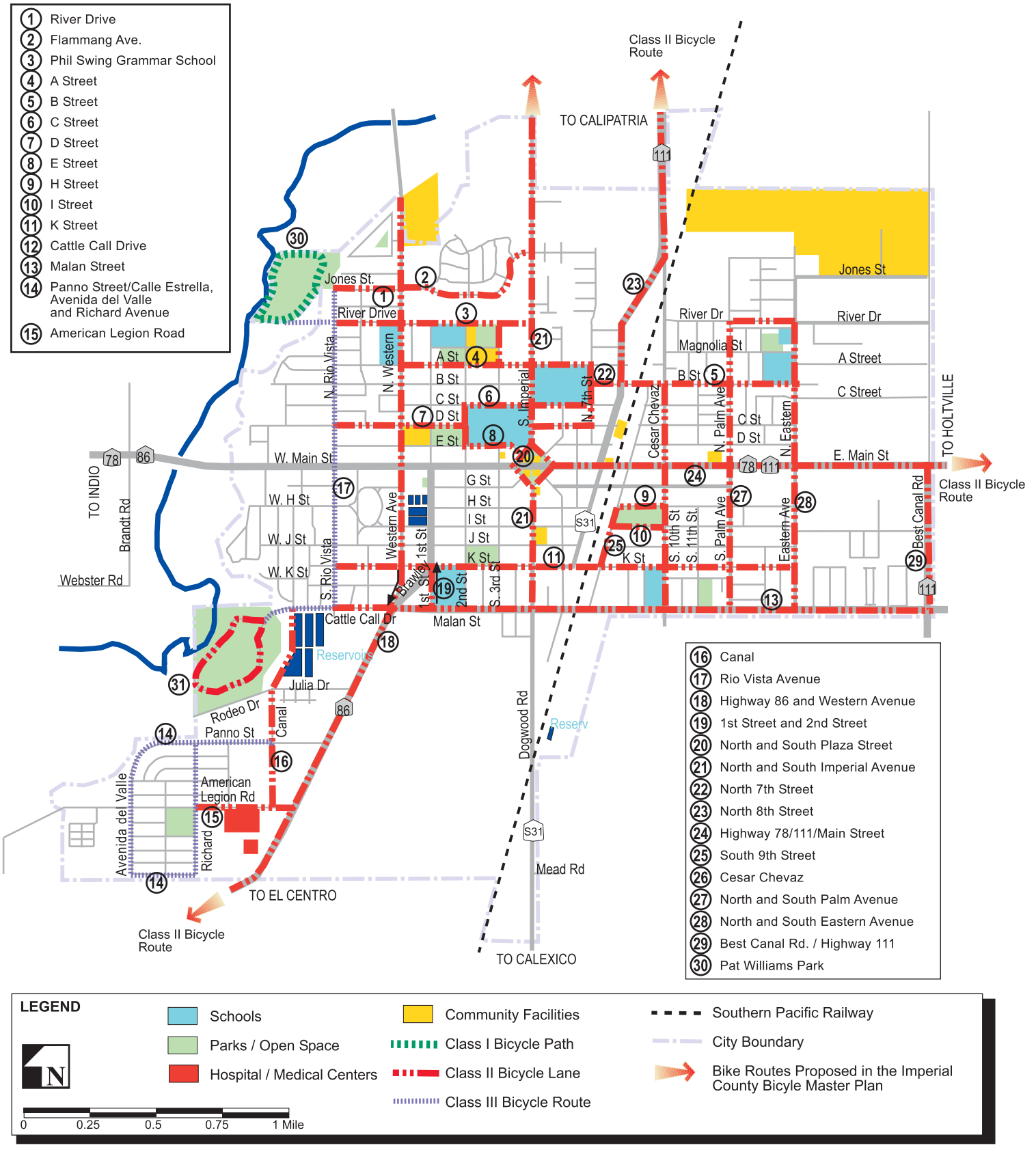
Description*:*

Improvements planned for Cattle Call Park consist of repaving portions of the entire existing perimeter road to improve the surface for bicyclists and pedestrians. The perimeter road will be signed and striped as a Class II bikeway. Other improvements include landscaping along the entrance.

Mileage and Cost:

The total length is 1.10 miles and the estimated cost to complete is $215,000.

Proposed Bicycle Facilities



C. Project Costs

The following is a list of typical costs for implementation based on the type of bicycle facility. The cost estimates include design and construction costs. All costs are based on 2002 dollars and should be adjusted accordingly. These costs are used to determine approximate cost to implement the proposed bikeway routes by miles. These costs may be used to determine the approximate costs to construct a route or segment. Preliminary engineering will provide a more definitive cost estimate.

Table 2.0
Unit Cost Estimates

Bikeway Facility	Cost Per Mile
Class III - Bike Route	
▪ Signing, minor surface repair	$1,000
▪ Rural road widening (32" shoulder)	20% of total roadway improvement costs
Class II - Bike Lane	
▪ Signing, striping, minor surface repair	$20,000
▪ Signing, striping, road widening	$65,000
Class I Bike Path	
▪ Rehabilitate or upgrade existing path	$50,000
▪ Construct Road Oyl Path on base. Includes signing.	$52,000
▪ Construct Road Oyl Path on base. Includes signing with removal of existing railroad tracks.	$96,000
• Construct asphalt path on existing level embankment, or right of way, includes signing, striping	$150,000
• Construct asphalt path on existing level embankment, or right of way, includes signing, striping with removal of existing railroad tracks.	$194,000
Support Facilities:	
▪ Signal Loop Detectors	$2,500/intersection
▪ Undercrossing	$150,000 - 350,000
▪ At-Grade Crossing	
▪ Signing, striping	$5,000
▪ Signing, striping, signals	$65,000
▪ Irrigated Landscaping	$350,000 - 600,000 mile
▪ Non-irrigated Landscaping	$150,000 - 300,000 mile
▪ Bridge (8' wide)	$60 - 100 square foot
▪ Fencing	$20 linear foot
▪ Railroad Crossing	$125,000
▪ Emergency Cellular Phone (installed)	$3,500

Cost estimates were based on actual cost experience in various California communities.
They are estimates only; more detailed estimates should be developed after preliminary engineering.

Implementation costs for each route are based on typical costs to construct. All routes were assumed to be located within the public right-of-way and not require acquisition. The following table lists each segment, length of the segment and estimated cost for implementation. From a bikeway perspective, bike lanes may be installed along the roadway provide adequate width is available. Brawley's roadways are generally wide enough to accommodate bicycle lanes provided there is also adequate width for vehicle parking. The exceptions to this occur when drainage ditches, curb cuts, utility poles or lack of right-of-way make widening expensive.

Implementation costs for Class II bicycle lanes were based on installing striping and signing at $5,000 a mile. Minor roadway surfacing may be necessary which would increase the estimated cost of each segment to approximately $65,000 a mile. Relocation of utilities or the removal of drainage ditches would be estimated on a case by case basis. The City should consider installing loop detectors at an estimated cost of $2,500 per intersection when repairing the streets, replacing utilities that require cutting into the asphalt, or when installing new traffic lights. Loop detectors designed to detect bicyclists at stop lights will encourage bicyclists to cycle more often and deter cyclists from darting across streets when the light doesn't turn green.

Table 3.0 Estimated Cost to Construct			
Segment	**Class I, II, III**	**Length (Miles)**	**Cost**
1. River Dr. west of Rio Vista (Pat Williams Park Access)	III	0.20	$110,000
2. Flammang Ave.	III	0.58	2,900
3. Phil Swing Grammar School (River Dr. east of Rio Vista).	II	0.81	4,050
4. A Street	II	0.74	3,700
5. B Street	II	0.78	3,900
6. C Street	II	0.26	1,300
7. D Street	II	0.70	3,500
8. E Street	II	0.34	1,700
9. H Street	II	0.16	800
10. I Street	II	0.17	850
11. K Street	II	1.75	1,750
12. Cattle Call Drive	III	0.27	17,550
13. Malan Street	III	2.02	2,020
14. Panno Street/Calle Estrella/ Avenida del Valle/ Richard Avenue	III	1.17	1,170
15. American Legion Road	III	0.24	240
16. Willard Avenue	II	0.43	2,150
17. Rio Vista Avenue	III	1.09	3,070
18. Highway 86/Western Avenue (One Side Only Between K and Malan St.)	II	2.50	12,550
19. 1st Street /2nd Street (One Street Side Only)	II	0.25	1,250
20. North and South Plaza Street	II	0.44	2,200
21. North and South Imperial Avenue	II	1.48	7,400
22. North 7th Street	II	0.08	400
23. North 8th Street	II	0.24	1,200
24. Highway 111/Main Street	II	0.57	2,850
25. South 9th Street	II	0.24	1,200
26. Cesar Chevaz (10th Street)	II	0.68	3,400
27. North and South Palm Avenue	II	1.06	5,300
28. North and South Eastern Avenue	II	0.66	3,300
29. Best Canal Rd. (Highway 111)	II	2.50	12,500
30. Pat Williams Park Multi-use Pathway*	I	.70	82,000
31. Cattle Call Park*	II	1.10	215,000
Total		24.21	$511,200

Costs are estimates only. More detailed estimates should be developed during preliminary engineering stage.
*Estimates determined by Dokken Engineering, January 2002.

D. Phasing Plan

The proposed 24.21 miles bikeway system, consisting of 31 different bicycle segments was based on existing bikeway routes and specific selection criteria. The total estimate to complete the Bicycle Master Plan is $511,200.

Table 4.0 lists each segment and provides a basis for rating each segment based on estimated usage, safety concerns, and location to schools, parks, and employment centers. The higher the segment is rated, the earlier the segment should be implemented. Phasing is ultimately based upon the availability of funding or safety. Factors which determine which route may be constructed is based on a) availability of funding for specific types of bikeways, b) capital improvement projects such as road widening, or c) immediate safety concerns about a specific area.

Existing Class II Bike Lane

Initially, the City should consider making minor improvements to the existing facilities as part of ongoing capital improvement projects. Existing bicycle facilities may need to be restriped. The bicycle lane along S. Rio Vista Avenue is located within the parking lane creating a hazard for cyclists and the bicycle lanes should be removed and bicycle route signs (Class III) installed. Additionally, the bicycle lane sign along K Street should be removed until the bicycle lanes are striped. In order to encourage biking to work, the City should consider implementing a bicycle rack program by installing bicycle racks at various locations along the retail corridor, parks, and bus stops and adopting standards that require bike racks for new commercial and industrial development.

The Phasing Plan below identifies four routes as having the highest priority with ratings 10 and above. These segments include Highway 86/Western Avenue, North and South Plaza Street, North and South Imperial Avenue and Highway 111/Main Street. Each of these segments which experience high traffic volumes and are located near employment centers. Other segments that should be implemented are those near schools and parks. These segments with a rating ranging from 6-10 include B Street, D Street, E Street, K Street, Malan Street, Canal, Cesar Chevaz, North and South Palm Avenue, North and South Eastern Avenue and Best Canal Road.

Table 4.0
Phasing Plan

Segment	Class I, II, III	Length (Miles)	A	B	C	D	Total
1. River Dr. west of Rio Vista (Pat Williams Park Access)	III	0.20	2	1	1	0	3
2. Flammang Ave.	II	0.58	1	1	0	0	2
3. Phil Swing Grammar School (River Dr. east of Rio Vista)	II	0.81	2	1	1	0	3
4. A Street	II	0.74	1	1	2	0	4
5. B Street	II	0.78	2	2	2	0	6
6. C Street	II	0.26	1	1	2	0	4
7. D Street	II	0.70	1	2	2	2	7
8. E Street	II	0.34	2	2	2	2	8
9. H Street	II	0.16	1	1	1	1	4
10. I Street	II	0.17	1	1	1	1	4
11. K Street	II	1.75	2	2	4	0	8
12. Cattle Call Drive	III	0.27	2	1	1	0	4
13. Malan Street	III	2.02	1	2	3	0	6
14. Panno Street/Calle Estrella/ Avenida del Valle/ Richard Avenue	III	1.17	1	1	1	2	5
15. American Legion Road	III	0.24	1	1	1	2	5
16. Willard Avenue	II	0.43	2	1	1	2	6
17. Rio Vista Avenue	III	1.09	2	1	1	0	5
18. Highway 86/Western Avenue (One Side Only Between K and Malan St.)	II	2.50	3	3	2	4	12
19. 1st Street /2nd Street (one side only)	II	0.25	2	1	1	0	4
20. North and South Plaza Street	II	0.44	3	3	3	3	12
21. North and South Imperial Avenue	II	1.48	3	3	3	4	13
22. North 7th Street	II	0.08	2	1	1	0	4
23. North 8th Street	II	0.24	2	3	0	0	5
24. Highway 111/Main Street	II	0.57	2	3	2	3	10
25. South 9th Street	II	0.24	1	2	1	0	4
26. Cesar Chevaz (10th Street)	II	0.68	3	2	2	0	7
27. North and South Palm Avenue	II	1.06	2	2	2	1	7
28. North and South Eastern Avenue	II	0.66	3	2	2	0	7
29. Best Canal Rd. (Highway 111)	II	2.50	3	2	2	0	7
30. Pat Williams Park Multi-use Pathway*	I	.70	3	1	2	0	5
31. Cattle Call Park*	II	1.10	3	2	1	0	6
Total		24.21					

A. Estimated Usage (1=low, 3=high)
B. Safety Concern (1=low, 3=high)
C. Schools/Parks (actual no. of schools)
D. Employment Centers (actual number)

E. Maintenance

Bicycle facilities must be maintained in an appropriate manner and a procedure for regular maintenance should be established. A regular maintenance program will increase safety, encourage use of the facilities, and increase longevity of the facility. The maintenance program should include a review of the condition of signs, pavement markings, barriers, and surface condition. Roadway dirt, debris, and potholes affect cyclists to a greater extent than cars. It is recommended that routine surveys of the bicycle facilities are conducted to remove glass and other debris, conduct routine restriping and sign replacement.

The City may find that it is useful to designate a staff person or local volunteer to serve as the bicycle coordinator. Local residents then know who to contact when there are maintenance, connectivity, and general cycling issues. This person would have the primary responsibility to implement the Master Plan by pursuing grant funds and coordinating with the Public Works or Engineering Department to incorporate bikeways into the Capitol Improvement Program (CIP). Tasks for the bicycle coordinator may include:

- Pursuing grants for bikeway projects and bicycle programs.
- Participating in Imperial Valley Association of Governments (IVAG) bicycle committees and other regional transportation groups involved in funding programs and transportation planning.
- Coordinating and promoting bikeway education, incentives, and awareness programs and events.
- Serving as the contact person for bikeway questions and concerns.
- Reviewing the Regional Transportation Improvement Plan (RTIP) to ensure consistency with local and regional bikeways.
- Participating with IVAG in the developing the Regional Transportation Plan (RTIP) as it relates to bicycle facilities.
- Assembling and storing bicycle accident data, usage data, and other statistical bikeway data.
- Maintaining a log of maintenance tasks, costs, and scheduled bikeway improvements.

F. Bikeway Funding

Federal, state and local government agencies invest billions of dollars every year in the nation's transportation systems. Only a fraction of that funding is in planning, designing and/or constructing bicycle facilities. In California, a portion of the gas tax is allocated for bicycle facilities. Effective January 1, 1998, the State of California's Bicycle Transportation Account was increased from $360,000 a year to $5 million a year based on the following schedule:

1998 - $1,000.000
1999 - $1,000,000
2000 - $1,000,000
2001 - $2,000,000
2002 - $2,000,000
2003 - $3,000,000
2004 - $5,000,000
Annually thereafter - $5,000,000

In 1998, ISTEA funds were reauthorized by TEA-21 (Transportation Equity Act for the 21st Century). Funds for bicycle projects in Imperial County over the next six years should increase over the levels under ISTEA since 1992. Changes in TEA-21 include:

1. The Surface Transportation Program (STP) was amended as follows:
- Approximately $33 billion available nationwide.
- Bicycle and pedestrian projects remain eligible.
- Sidewalk improvements to comply with the Americans with Disabilities Act (ADA) are now eligible for Surface Transportation Program funds.

2. The National Highway System (NHS) program was amended as follows:
- Pedestrian projects may now be funded with NHS funds.
- NHS funds may now used on bicycle and pedestrian projects within Interstate corridors.

3. The Transportation Enhancements (TE) program was amended as follows:
- $3.3 billion available nationwide
- Bicycle and pedestrian safety and education programs
- Tourist and welcome centers
- Environmental mitigation to provide wildlife corridors
- Requirement that each project be directly related to a surface *transportation* project
- Eighty (80) percent Federal matching requirement applies only to total non-Federal share rather than total project cost.
- Twenty-five (25) percent of the TE funds received over the amount received in FY 1997 may be transferred to other STP activities.
- Eight (8) specific projects are funded off the top of the TE program, none in the Western United States.

4. The Congestion Mitigation and Air Quality Improvements (CMAQ) program was amended as follows:
- $8.12 billion available nationwide
- Bicycle project eligibility remains essentially the same
- A small percentage can be transferred to other programs

5. The Recreational Trails Program was amended as follows:
- $270 million available nationwide over the next six years
- Bicycle project eligibility remains essentially the same

6. The Hazard Elimination Program was amended as follows:
- Now can be used for bicycling and walking hazards
- Definition of a 'public road' now expended to include bikeways, pathways, and traffic calming measures.

7. A new category, Transit Enhancements Program, was created that calls for transit agencies in urbanized areas over 200,000 population to use 1 percent of their Urban Formula Funds for Transit Enhancements Activities. Up to $50 million per year may be available for pedestrian access, walkways, bicycle access, bike storage facilities, and bike-on-bus racks. The program calls for 95% Federal/5% local match.

8. Scenic Byway, bridge repair, transit, safety (non-construction), and Federal Lands programs all remain essentially the same under TEA-21, with the amounts either the same or increasing from ISTEA.

Planning provisions for states and MPOs have been streamlined, with bicycle and pedestrian needs to be given consideration in the development of transportation plans. Specific policies include directives to not approve any project or regulatory action that will have an adverse impact on non-motorized safety, unless a reasonable alternative route is provided or already exists.

1. When state or local regulations permit, allow use of bicycle facilities by electric bicycles and motorized wheelchairs.
2. Railway-highway crossings should consider bicycle safety.
3. A new Surface Transportation-Environment Cooperative Research Program is established for funding non-motorized research.
4. In cooperation with AASHTO, ITE, and other groups, establish new bicycle design guidelines within 18 months.

A detailed program-by-program of available funding programs along with the latest relevant information is provided in the appendix.

G. Plan Review and Update

The City of Brawley should review and update the plan every four years. An assessment of the successes of completed facilities should be included and a reappraisal of cost estimates. Public review of the proposed routes should be revisited to determine if there are modifications to the routes or additional routes should be added to meet the ongoing demand for bicycle facilities.

APPENDIX

A. SOURCES CONSULTED

1. California Department of Transportation, Streets and Highways Code, Section 890-894.2.

2. Brawley, California's Chamber of Commerce, June 1, 2001

3. City of Brawley, General Plan, 1995

4. City of Brawley, web page, March 20, 2001

5. City of Brawley, Police Department, Bicycle Accident Statistics, June 8, 2001

6. U. S. Census, 2000

7. Denver, City of. "Rules and Regulations for Bicycle Parking in Areas in Denver", 12/23/1998.

8. Data compiled by the Pedestrian and Bicycle Information Center by Association of Pedestrian and Bicycle Professionals, March 2001.

9. Dokken Engineer, Kirk Bradbury, January 11, 2002

10. Florida Department of Transportation, "Florida Bicycle Facilities Planning and Design Handbook", November 1997.

11. New Jersey Department of Transportation, "Bicycle Compatible Roadways and Bikeways, Planning and Design Guidelines", April 1995.

12. U. S. Department of Transportation, "National Bicycling and Walking Study", Publication No. FHWA-PD-92-041.

13. Wachtel, Alan, "Bicycles and the Law: The Case of California".

14. Wallace Roberts & Todd, County of Imperial Bicycle Master Plan, 1999.

15. Wallace Roberts & Todd, City of El Centro Bicycle Master Plan, 2000.

B. COST ASSUMPTIONS

Cost Assumptions for Multi-Use Bikeway (Class I)	
Multi Use Trail/Bike Path (8')	**Cost Per LF**
Adjacent to roadway, level terrain, minimal grading	$50 - 65
Adjacent to roadway, moderate slope, some cut and fill	$60 - 75
Adjacent to roadway, steep slope, retaining wall	$90 - 110
Level terrain, minimal grading	$20 - 25
Moderate slope, some cut and fill	$25 - 35
Roadway Improvements	**Cost per LF**
2 - 4 feet asphalt/base, some fill, debris removal, relocate some fencing and utilities, restripe	$25 - 35
2 - 4 feet asphalt/base, some fill, debris removal, relocate some fencing and utilities, restripe, and new guardrail	$60 - 70

Typical Bikeway Cost Items

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Total Cost
1	Clearing & Grubbing		L.F.	$10-40	
2	Earth/Excavation		C.Y.	$30-40	
3	Asphalt Concrete Pavement		S.F.	$1.20 - 1.50	
4	Traffic Bike Lane Stripe		L.F.	$.60 - .80	
5	Pavement Markings		EA.	$40 - 50	
6	Fencing (chain link)		L.F.	$16 - 20	
7	Guardrail		L.F.	$20 - 25	
8	8' Steel or concrete Bridge		L.F.	$1,200 - 1,500	
9	3' Retaining Walls (Concrete)		S.F.	$32 - 40	
10	Relocate Signs/Fencing		L.F.	$1.00 - 2.00	
11	Drainage		L.F.	$1.00 - 5.00	
12	Environmental Mitigation		L.F.	$.50 - 2.50	
13	Traffic/Bike Path Signing		L.F.	$2.40 - 3.00	
14	Lighting		EA.	$500.00	
15	Traffic Control		L.F.	$.20 - .40	
16	Clean-up		L.F.	$.10 - .20	
Subtotal 15% Design Cost 20% Contingency					
Total Cost					

C. FUNDING SUMMARY

Funding Program:	**Transportation Equity Act for the 21st Century (TEA- 21)**
Funding Type:	Federal
Summary Description:	TEA-21 provides funding for roads, transit, safety and environmental enhancements. General state and local improvements for highways and bridges that accommodate additional modes of transit. Including, capital costs, publicly owned intercity facilities, and bicycle and pedestrian facilities.
Eligible Applicants:	Cities, counties, transit operators. Special districts may apply with sponsorship from an eligible applicant.
Typical Funding Amounts:	Estimated at approximately $215 billion over the next 6 years, an increase of approximately $60 billion over ISTEA legislation.
Required Matching Funds:	An 11.5% match is required.
Name of Funding Program:	**Surface Transportation Program Fund (STP) (Section 1108)**
Funding Type:	Federal
Summary Description:	The Surface Transportation Program is a block grant fund. Funds are used for roads, bridges, transit capital and pedestrian and bicycle projects.
Eligible Applicants:	Cities, counties, transit operators, Caltrans and Metropolitan Planning Organizations. Non-profit organizations and special districts may also apply with sponsorship from an eligible agency.
Typical Funding Amounts:	Approximately $535 million annually.
Required Matching Funds:	A local match of 20% is required for bicycle and pedestrian projects, 11.5% is required for all other types of projects.
Name of Funding Program:	**Transportation Enhancements Program**
Funding Type:	Federal
Summary Description:	The TE Program is a 10% set aside of the Surface Transportation Program. Projects must have a direct relationship to the intermodal transportation system through function, proximity, or impact.
Eligible Applicants:	Local, regional and state public agencies, special districts, non-profit and private organizations. Cities, counties and transit operators must sponsor and administer the proposed projects.
Typical Funding Amounts:	Approximately $630 million annually.
Required Matching Funds:	A 11.5% local match is required.
Name of Funding Program:	**Congestion Mitigation and Air Quality Improvement Program (CMAQ) (Section 1110)**
Funding Type:	Federal
Summary Description:	Funds are available for projects that will help attain National Ambient Air Quality Standards (NAAQS) identified in the 1990 federal Clean Air Act Amendments. Eligible projects include bicycle and pedestrian transportation facilities.
Eligible Applicants:	Cities, counties, transit operators, Caltrans and MPOs. Non-profit organizations and Special districts may also apply with sponsorship from an eligible agency.
Typical Funding Amounts:	Approximately $277 million annually.
Required Matching Funds:	A 20% local or state match is required.

Name of Funding Program:	**National Highway System Fund (NHS)**
Funding Type:	Federal
Summary Description:	NHS funds are to provide for an interconnected system of principal arterial routes. The programs goal is to provide access to major population centers, international border crossings, transportation systems, meet national defense requirements and serve interstate and interregional travel, which includes access for bicyclists and pedestrians. Facilities must be located and designed pursuant to an overall plan developed by each MPO and State, and incorporated into the RTIP.
Eligible Applicants:	State and local governments.
Typical Funding Amounts:	Approximately $441 million annually.
Required Matching Funds:	A local or state match of 20% is required.
Key Changes in TEA-21:	NHS funds can now be spent on nonmotorized projects within Interstate corridors. (Section 1202)
Contact:	IVAG (refer to Appendix A)

Name of Funding Program:	**Federal Lands Highway Program Fund**
Funding Type:	Federal
Summary Description:	This Discretionary Program provides funding for any kind of transportation project (including pedestrian and bicycle facilities) that are within, provide access to or are adjacent to public lands. Facilities must be incorporated into the RTIP.
Eligible Applicants:	Local jurisdictions, Caltrans, Bureau of Land Management (BLM), and the National Trail System Program.
Typical Funding Amounts:	Approximately $150 million per annum rising to $165 million in FY 2003.
Required Matching Funds:	No match required.

Name of Funding Program:	**Scenic Byways Program Fund**
Funding Type:	Federal
Summary Description:	This program provides funding for the planning, design, and development of a State Scenic Byways Program. Funds may be used for the construction of facilities along the highway for the use of pedestrians and bicyclist, including pedestrian/bicycle access, safety improvements, and rest areas.
Eligible Applicants:	Local government agencies.
Typical Funding Amounts:	Approximately $10 million annually statewide.
Required Matching Funds:	A 20% local match is required.

Name of Funding Program:	**Bridge Repair and Replacement Program**
Funding Type:	Federal
Summary Description:	Funds are available for bridge rehabilitation and replacement. All bridges are eligible, and on-system bridges are eligible for discretionary funding. Bridge projects must be incorporated into the RTIP.
Eligible Applicants:	City and county agencies, park and recreation districts. All agencies must have a city, county or transit operator as a sponsor.
Typical Funding Amounts:	Approximately $260 million annually.
Required Matching Funds:	No local match requirements specifically for bicycle accommodations.

Name of Funding Program:	**National Recreational Trails Fund (Section 1112)**
Funding Type:	Federal
Summary Description:	Funds are available for recreational trails for use by bicyclists, pedestrians, and other non-motorized and motorized users. Projects must be consistent with a Statewide Comprehensive Outdoor Recreation Plan (SCORP). Annual funding begins at $30 million for FY 1998, it rises to $40 million for FY 1999 and increases to $50 million per annum for the remaining years.
Eligible Applicants:	Private individuals or organizations, counties, cities, and other government agencies.
Typical Funding Amounts:	Approximately $3 million annually.
Required Matching Funds:	The State is required to use a portion of its tax revenue from fuel for off-highway recreation purposes.

Name of Funding Program:	**National Highway Safety Act (Section 402)**
Funding Type:	Federal
Summary Description:	The Highway Safety Program is a non-capital safety project grant program under which states may apply for funds for certain approved safety programs and activities. Eligible projects include pedestrian and bicycle safety programs, program implementation, and identification of highway hazards.
Eligible Applicants:	State departments, cities, counties, school and special districts.
Typical Funding Amounts:	Approximately $150 million per annum rising to $165 million in FY 2003.
Required Matching Funds:	No match required.

Name of Funding Program:	**Transit Enhancement Activity (Section 3003)**
Funding Type:	Federal
Summary Description:	This brand new program is created with a one- percent set-aside of Urban Area Formula transit grants (3007). The funding which could amount to $50 million per year, can be used for among other things bicycle and pedestrian access to mass transportation.
Eligible Applicants:	Pending.
Typical Funding Amounts:	Formula is pending.
Required Matching Funds:	A 5% match required.

Name of Funding Program:	**Highway Safety, Research, and Development Fund (Section 2003)**
Funding Type:	Federal
Summary Description:	Provides funding for research on all phases of highway safety and traffic conditions. Uses, training and education of highway safety personnel, research fellowships in highway safety, development of improved accident investigation procedures, emergency service plan, and demonstration projects. Projects include improving pedestrian safety through education, police enforcement, and traffic engineering. Projects must be incorporated into the RTIP.
Eligible Applicants:	Cities, counties, and state agencies. Programs are often run by local community traffic safety programs.
Typical Funding Amounts:	

Name of Funding Program:	**Schools and Roads Grants to States**
Funding Type:	Federal
Summary Description:	Funds are used public roads and schools that are located in the same county as a National Forest.
Eligible Applicants:	Cities and counties containing National Forest Land.
Typical Funding Amounts:	Formula grants are 25% of the receipts collected from timber and land use fees to the respective counties. Fifty percent of these funds are used for roads.
Required Matching Funds:	No match required.

Name of Funding Program:	**Section 3 Mass Transit Capital Grants**
Funding Type:	Federal
Summary Description:	This discretionary funding program is used to finance mass transit systems, especially rail systems in urbanized areas with populations over 50,000 or more. Projects include station access, including bicycle and pedestrian access, and American with Disabilities Act projects, implementation of shelters, bicycle parking facilities, racks, and other equipment for transporting bicycles on transit vehicles.
Eligible Applicants:	States, regional and local governments, appropriate boards and commissions, and transit operators.
Typical Funding Amounts:	
Required Matching Funds:	A local match of 10% is required for bicycle projects, 5% for ADA projects.
Procedure for Project	Projects must be included in the RTIP. Congress

Name of Funding Program:	**Section 9 Mass Transit Formula Grants**
Funding Type:	Federal
Summary Description:	Eligible projects include construction, maintenance, improvement, and acquisition of transit facilities and access projects for bicycles.
Eligible Applicants:	Urban areas with a population of 50,000 or more are eligible if a comprehensive mass transportation planning process exists. State, and local governments, and transit operators are eligible. Public and private non-profit organizations are eligible for subgrants. Projects must be consistent with the RTP and must be incorporated into the RTIP.
Required Matching Funds:	A local match of 10% is required for bicycle projects.

Name of Funding Program:	**Local Transportation Fund (LTF), TDA Article 3**
Funding Type:	State
Summary Description:	TDA funds transportation improvements. One quarter cent of retail sales tax is returned to the county of origin. Up to two percent of funds can be set aside for pedestrian and bicycle facilities, and five percent can be spent for supplementing other funds to implement bicycle safety education programs. 2% TDA funds are lumped together with TransNet (Proposition A) funds in the San Diego Area.
Eligible Applicants:	Local jurisdictions.
Typical Funding Amounts:	Approximately $2.5 million annually, of which 1 million comes from TransNet (Proposition A).
Required Matching Funds:	No matching funds are required.

Name of Funding Program:	**California Bicycle Transportation Act; Bicycle Transportation Account (BTA)**
Funding Type:	State
Summary Description:	The purpose of the Bicycle Transportation Account is to improve the safety and convenience of bicycling for utilitarian reasons. BTA funds are available for jurisdictions with approved bicycle transportation plans. No agency may receive more than 25% of the total funds appropriated. Priority projects serve bicycle commuters, have activity centers at each end point, are consistent with the bicycle plan/program, and close missing links. Projects must be consistent with local Bikeway Plans, the RTP and incorporated into the RTIP if projects are regionally significant.
Eligible Applicants:	Cities and counties with approved bicycle plans.
Typical Funding Amounts:	$12million for a 5-year period 2001-2006..
Required Matching Funds:	A local match of 10% is required.

Name of Funding Program:	**Environmental Enhancement and Mitigation Program**
Funding Type:	State
Summary Description:	Funds are allocated to projects that offset environmental impacts of modified or new public transportation facilities and the acquisition or development of roadside recreational facilities, such as trails.
Eligible Applicants:	Non-profit, local, state, and federal agencies.
Typical Funding Amounts:	The program is funded at $10 million for 10 years, a $500,000 cap on individual projects is set.
Required Matching Funds:	No match required.

Name of Funding Program:	**Flexible Congestion Relief (FCR) Program**
Funding Type:	State
Summary Description:	This program is designed to reduce congestion on major transportation corridors by adding capacity to either roadways or urban rail transit systems. Projects must be consistent with the Regional Transportation Plan and must be included in the RTIP, particularly, the county's Congestion Management Program (CMP).
Eligible Applicants:	Cities, counties, transit operators, Caltrans, and other state and federal agencies.
Typical Funding Amounts:	Approximately $300 million annually statewide.
Required Matching Funds:	No match required.

Name of Funding Program:	**Habitat Conservation Fund Grant Program**
Funding Type:	State
Summary Description:	This program originates from the California Wildlife Protection Act of 1990 (Prop 117). Eligible projects include the acquisition of various types of wildlife habitats, enhancement and restoration of various Projects must be incorporated into the RTIP if they are regionally significant.
Eligible Applicants:	Cities, counties, and special districts.
Required Matching Funds:	A local match of 50% is required. The local match can not be a state source.

Name of Funding Program:	**Land and Water Conservation Fund**
Funding Type:	State
Summary Description:	This program provides grants to plan, acquire, and develop recreational parks and facilities, especially in urban areas. Funds are based on a State Comprehensive Outdoor Recreation Plan, and limited to outdoor recreational projects.. Projects must be incorporated into the RTIP if they are regionally significant.
Eligible Applicants:	Cities, counties, park and recreation departments, special districts with park and recreation areas, State Department of Parks and Recreation, Wildlife Conservation Board, Department of Water Resources, and Department of Boating and Waterways.:
Required Matching Funds:	50% is reimbursed to eligible agencies.

Name of Funding Program:	**TransNet Local Sales Tax Program (Proposition A)**
Funding Type:	Local
Summary Description:	Proposition A is a local sales tax to fund transportation improvements. The tax generates $1 million annually. The funds are used to augment the available TDA funds. Proposition A funds are lumped with 2% TDA funds.
Eligible Applicants:	Cities, County, and Transportation Agencies.
Typical Funding Amounts:	1 million annually.
Required Matching Funds:	No match required.

Name of Funding Program:	**Transportation Fund for Clean Air (TFCA)**
Funding Type:	Regional
Summary Description:	Clean Air Funds are generated by a surcharge on automobile registration. Approximately $3 million is available biannually. These funds are competitive based on the projects cost effectiveness.
Eligible Applicants:	Cities, County, Transportation Authority, and Transportation Agencies.
Typical Funding Amounts:	Approximately $3 million region-wide for FY 2000-01.
Required Matching Funds:	No matching funds required.

D. FUNDING PROGRAM CONTACTS

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Caltrans
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California Department of Transportation
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CHAPTER 1000 BIKEWAY PLANNING AND DESIGN

Topic 1001 - General Criteria

Index 1001.1 - Introduction

The needs of non-motorized transportation are an essential part of all highway projects. Topic 105 discusses Pedestrian Facilities with Index 105.3 addressing accessibility needs. This chapter discusses bicycle travel. All city, county, regional and other local agencies responsible for bikeways or roads where bicycle travel is permitted must follow the minimum bicycle planning and design criteria contained in this and other chapters of this manual (See Streets and Highways Code Section 891).

Bicycle travel can be enhanced by improved maintenance and by upgrading existing roads used regularly by bicyclists, regardless of whether or not bikeways are designated. This effort requires increased attention to the right-hand portion of roadways where bicyclists are expected to ride. On new construction, and major reconstruction projects, adequate width should be provided to permit shared use by motorists and bicyclists. On resurfacing projects, it is important to provide a uniform surface for bicyclists and pedestrians. See Index 625.1(1) and 635.1(1) for guidance in accommodating bicyclist and pedestrian needs on resurfacing projects. **When adding lanes or turn pockets, a minimum 1.2 m shoulder shall be provided (see Topic 405 and Table 302.1).** When feasible, a wider shoulder should be considered. When placing a roadway edge line, sufficient room outside the line should be provided for bicyclists. When considering the restriping of roadways for more traffic lanes, the impact on bicycle travel should be assessed. Bicycle and pedestrian traffic through construction zones should be addressed in the project development process. These efforts, to preserve or improve an area for use by bicyclists, can enhance motorist and bicyclist safety and mobility.

1001.2 The Role of Bikeways

Bikeways are one element of an effort to improve bicycling safety and convenience - either to help accommodate motor vehicle and bicycle traffic on shared roadways, or to complement the road system to meet needs not adequately met by roads.

Off-street bikeways in exclusive corridors can be effective in providing new recreational opportunities, or in some instances, desirable commuter routes. They can also be used to close gaps where barriers exist to bicycle travel (e.g., river crossing). On-street bikeways can serve to enhance safety and convenience, especially if other commitments are made in conjunction with establishment of bikeways, such as: elimination of parking or increasing roadway width, elimination of surface irregularities and roadway obstacles, frequent street sweeping, establishing intersection priority on the bike route street as compared with the majority of cross streets, and installation of bicycle-sensitive loop detectors at signalized intersections.

1001.3 The Decision to Develop Bikeways

The decision to develop bikeways should be made with the knowledge that bikeways are not the solution to all bicycle-related problems. Many of the common problems are related to improper bicyclist and motorist behavior and can only be corrected through effective education and enforcement programs. The development of well conceived bikeways can have a positive effect on bicyclist and motorist behavior. Conversely, poorly conceived bikeways can be counterproductive to education and enforcement programs.

1001.4 Definitions

The Streets and Highway Code Section 890.4 defines a "Bikeway" as a facility that is provided primarily for bicycle travel.

(1) Class I Bikeway (Bike Path). Provides a completely separated right of way for the exclusive use of bicycles and pedestrians with crossflow by motorists minimized.

(2) Class II Bikeway (Bike Lane). Provides a striped lane for one-way bike travel on a street or highway.

(3) Class III Bikeway (Bike Route). Provides for shared use with pedestrian or motor vehicle traffic.

1001.5 Streets and Highways Code References - Chapter 8 - Nonmotorized Transportation

(a) Section 887 -- Definition of nonmotorized facility.

(b) Section 887.6 -- Agreements with local agencies to construct and maintain nonmotorized facilities.

(c) Section 887.8 -- Payment for construction and maintenance of nonmotorized facilities approximately paralleling State highways.

(d) Section 888 - - Severance of existing major nonmotorized route by freeway construction.

(e) Section 888.2 -- Incorporation of nonmotorized facilities in the design of freeways.

(f) Section 888.4 -- Requires Caltrans to budget not less than $360,000 annually for nonmotorized facilities used in conjunction with the State highway system.

(g) Section 890.4 -- Class I, II, and III bikeway definitions.

(h) Section 890.6 - 890.8 -- Caltrans and local agencies to develop design criteria and symbols for signs, markers, and traffic control devices for bikeways and roadways where bicycle travel is permitted.

(i) Section 891 -- Local agencies must comply with design criteria and uniform symbols.

(j) Section 892 -- Use of abandoned right-of-way as a nonmotorized facility.

1001.6 Vehicle Code References - Bicycle Operation

(a) Section 21200 -- Bicyclist's rights and responsibilities for traveling on highways.

(b) Section 21202 -- Bicyclist's position on roadways when traveling slower than the normal traffic speed.

(c) Section 21206 -- Allows local agencies to regulate operation of bicycles on pedestrian or bicycle facilities.

(d) Section 21207 -- Allows local agencies to establish bike lanes on non-state highways.

(e) Section 21207.5 -- Prohibits motorized bicycles on bike paths or bike lanes.

(f) Section 21208 -- Specifies permitted movements by bicyclists from bike lanes.

(g) Section 21209 -- Specifies permitted movements by motorists in bike lanes.

(h) Section 21210 -- Prohibits bicycle parking on sidewalks unless pedestrians have an adequate path.

(i) Section 21211 -- Prohibits impeding or obstruction of bicyclists on bike paths.

(j) Section 21717 -- Requires a motorist to drive in a bike lane prior to making a turn.

(k) Section 21960 -- Use of freeways by bicyclists.

Topic 1002 - Bikeway Facilities

1002.1 Selection of the Type of Facility

The type of facility to select in meeting the bicycle need is dependent on many factors, but the following applications are the most common for each type.

(1) Shared Roadway (No Bikeway Designation). Most bicycle travel in the State now occurs on streets and highways without bikeway designations. This probably will be true in the future as well. In some instances, entire street systems may be fully adequate for safe and efficient bicycle travel, and signing and

pavement marking for bicycle use may be unnecessary. In other cases, prior to designation as a bikeway, routes may need improvements for bicycle travel.

Many rural highways are used by touring bicyclists for intercity and recreational travel. It might be inappropriate to designate the highways as bikeways because of the limited use and the lack of continuity with other bike routes. However, the development and maintenance of 1.2 m paved roadway shoulders with a standard 100 mm edge line can significantly improve the safety and convenience for bicyclists and motorists along such routes.

(2) *Class I Bikeway (Bike Path)*. Generally, bike paths should be used to serve corridors not served by streets and highways or where wide right of way exists, permitting such facilities to be constructed away from the influence of parallel streets. Bike paths should offer opportunities not provided by the road system. They can either provide a recreational opportunity, or in some instances, can serve as direct high-speed commute routes if cross flow by motor vehicles and pedestrian conflicts can be minimized. The most common applications are along rivers, ocean fronts, canals, utility right of way, abandoned railroad right of way, within college campuses, or within and between parks. There may also be situations where such facilities can be provided as part of planned developments. Another common application of Class I facilities is to close gaps to bicycle travel caused by construction of freeways or because of the existence of natural barriers (rivers, mountains, etc.).

(3) *Class II Bikeway (Bike Lane)*. Bike lanes are established along streets in corridors where there is significant bicycle demand, and where there are distinct needs that can be served by them. The purpose should be to improve conditions for bicyclists in the corridors. Bike lanes are intended to delineate the right of way assigned to bicyclists and motorists and to provide for more predictable movements by each. But a more important reason for constructing bike lanes is to better accommodate bicyclists through corridors where insufficient room exists for safe bicycling on existing streets. This can be accomplished by reducing the number of lanes, reducing lane width, or prohibiting parking on given streets in order to delineate bike lanes. In addition, other things can be done on bike lane streets to improve the situation for bicyclists, that might not be possible on all streets (e.g., improvements to the surface, augmented sweeping programs, special signal facilities, etc.). Generally, pavement markings alone will not measurably enhance bicycling.

If bicycle travel is to be controlled by delineation, special efforts should be made to assure that high levels of service are provided with these lanes.

In selecting appropriate streets for bike lanes, location criteria discussed in the next section should be considered.

(4) *Class III Bikeway (Bike Route)*. Bike routes are shared facilities which serve either to:

(a) Provide continuity to other bicycle facilities (usually Class II bikeways); or

(b) Designate preferred routes through high demand corridors.

As with bike lanes, designation of bike routes should indicate to bicyclists that there are particular advantages to using these routes as compared with alternative routes. This means that responsible agencies have taken actions to assure that these routes are suitable as shared routes and will be maintained in a manner consistent with the needs of bicyclists. Normally, bike routes are shared with motor vehicles. The use of sidewalks as Class III bikeways is strongly discouraged.

It is emphasized that the designation of bikeways as Class I, II and III should not be construed as a hierarchy of bikeways; that one is better than the other. Each class of bikeway has its appropriate application.

In selecting the proper facility, an overriding concern is to assure that the proposed facility will not encourage or require bicyclists or

motorists to operate in a manner that is inconsistent with the rules of the road.

An important consideration in selecting the type of facility is continuity. Alternating segments of Class I and Class II (or Class III) bikeways along a route are generally incompatible, as street crossings by bicyclists are required when the route changes character. Also, wrong-way bicycle travel will occur on the street beyond the ends of bike paths because of the inconvenience of having to cross the street.

Topic 1003 - Design Criteria

1003.1 Class I Bikeways

Class I bikeways (bike paths) are facilities with exclusive right of way, with cross flows by motorists minimized. Section 890.4 of the Streets and Highways Code describes Class I bikeways as serving "the exclusive use of bicycles and pedestrians". However, experience has shown that if significant pedestrian use is anticipated, separate facilities for pedestrians are necessary to minimize conflicts. Dual use by pedestrians and bicycles is undesirable, and the two should be separated wherever possible.

Sidewalk facilities are not considered Class I facilities because they are primarily intended to serve pedestrians, generally cannot meet the design standards for Class I bikeways, and do not minimize motorist cross flows. See Index 1003.3 for discussion relative to sidewalk bikeways.

By State law, motorized bicycles ("mopeds") are prohibited on bike paths unless authorized by ordinance or approval of the agency having jurisdiction over the path. Likewise, all motor vehicles are prohibited from bike paths. These prohibitions can be strengthened by signing.

(1) Widths. **The minimum paved width for a two-way bike path shall be 2.4 m. The minimum paved width for a one-way bike path shall be 1.5 m. A minimum 0.6 m wide graded area shall be provided adjacent to the pavement (see Figure 1003.1A).** A 1.0 m graded area is recommended to provide clearance from poles, trees, walls, fences, guardrails, or other lateral obstructions. A wider graded area can also serve as a jogging path. Where the paved width is wider than the minimum required, the graded area may be reduced accordingly; however, the graded area is a desirable feature regardless of the paved width. Development of a one-way bike path should be undertaken only after careful consideration due to the problems of enforcing one-way operation and the difficulties in maintaining a path of restricted width.

Where heavy bicycle volumes are anticipated and/or significant pedestrian traffic is expected, the paved width of a two-way path should be greater than 2.4 m, preferably 3.6 m or more. Another important factor to consider in determining the appropriate width is that bicyclists will tend to ride side by side on bike paths, necessitating more width for safe use.

Experience has shown that paved paths less than 3.6 m wide sometimes break up along the edge as a result of loads from maintenance vehicles.

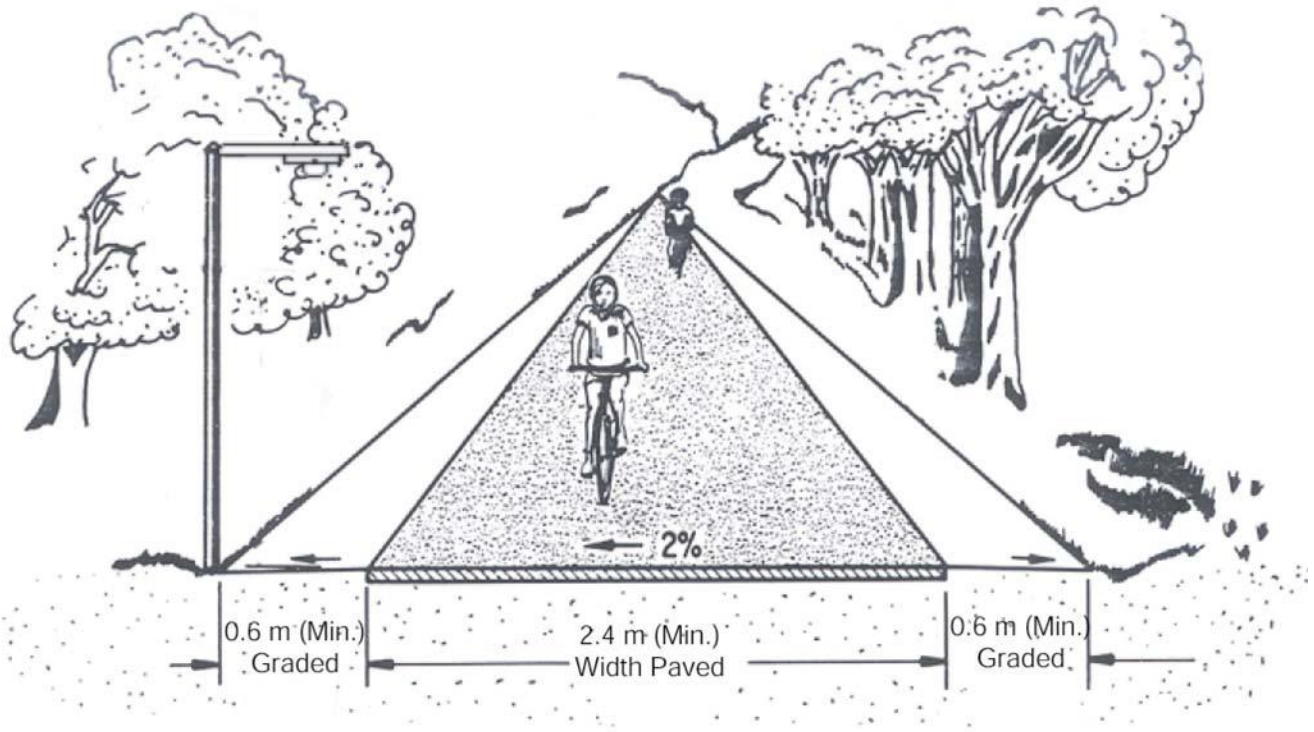
Where equestrians are expected, a separate facility should be provided.

(2) Clearance to Obstructions. **A minimum 0.6 m horizontal clearance to obstructions shall be provided adjacent to the pavement (see Figure 1003.1A).** A 1.0 m clearance is recommended. Where the paved width is wider than the minimum required, the clearance may be reduced accordingly; however, an adequate clearance is desirable regardless of the paved width. If a wide path is paved contiguous with a continuous fixed object (e.g., block wall), a 100 mm white edge line, 0.6 m from the fixed object, is recommended to minimize the likelihood of a bicyclist hitting it. **The clear width on structures between railings shall be not less than 2.4 m.** It is desirable that the clear width of structures be equal to the minimum clear width of the path (i.e., 3.6 m).

The vertical clearance to obstructions across the clear width of the path shall be a minimum of 2.5 m. Where practical, a vertical clearance of 3 m is desirable.

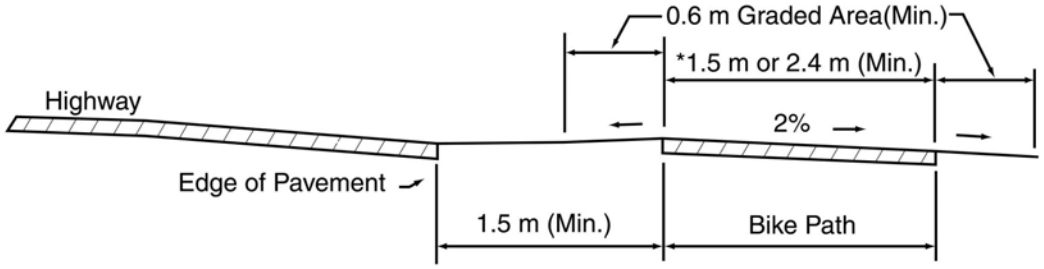
Figure 1003.1A

Two-Way Bike Path on Separate Right of Way



Note: For sign clearances, see MUTCD, Figure 9B-1.

Figure 1003.1B
Typical Cross Section of Bike Path Along HIghway



NOTE: See Index 1003.1(5)

*One - Way: 1.5 m Minimum Width
Two - Way: 2.4 m Minimum Width

(3) *Signing and Delineation*. For application and placement of signs, see the Manual on Uniform Traffic Control Devices (MUTCD), Section 9B.01 and the MUTCD and California Supplement Section 9B.01 and Figure 9B-101. For pavement marking guidance, see the MUTCD, Section 9C.03.

(4) *Intersections with Highways*. Intersections are a prime consideration in bike path design. If alternate locations for a bike path are available, the one with the most favorable intersection conditions should be selected.

Where motor vehicle cross traffic and bicycle traffic is heavy, grade separations are desirable to eliminate intersection conflicts. Where grade separations are not feasible, assignment of right of way by traffic signals should be considered. Where traffic is not heavy, stop or yield signs for bicyclists may suffice.

Bicycle path intersections and approaches should be on relatively flat grades. Stopping sight distances at intersections should be checked and adequate warning should be given to permit bicyclists to stop before reaching the intersection, especially on downgrades.

When crossing an arterial street, the crossing should either occur at the pedestrian crossing, where motorists can be expected to stop, or at a location completely out of the influence of any intersection to permit adequate opportunity for bicyclists to see turning vehicles. When crossing at midblock locations, right of way should be assigned by devices such as yield signs, stop signs, or traffic signals which can be activated by bicyclists. Even when crossing within or adjacent to the pedestrian crossing, stop or yield signs for bicyclists should be placed to minimize potential for conflict resulting from turning autos. Where bike path stop or yield signs are visible to approaching motor vehicle traffic, they should be shielded to avoid confusion. In some cases, Bike Xing signs may be placed in advance of the crossing to alert motorists. Ramps should be installed in the curbs, to preserve the utility of the bike path. Ramps should be the same width as the bicycle paths. Curb cuts and ramps should provide a smooth transition between the bicycle paths and the roadway.

(5) *Separation Between Bike Paths and Highways*. A wide separation is recommended between bike paths and adjacent highways (see Figure 1003.1B). **Bike paths closer than 1.5 m from the edge of the shoulder shall include a physical barrier to prevent bicyclists from encroaching onto the highway. Bike paths within the clear recovery zone of freeways shall include a physical barrier separation.** Suitable barriers could include chain link fences or dense shrubs. Low barriers (e.g., dikes, raised traffic bars) next to a highway are not recommended because bicyclists could fall over them and into oncoming automobile traffic. In instances where there is danger of motorists encroaching into the bike path, a positive barrier (e.g., concrete barrier, steel guardrailing) should be provided. See Index 1003.6 for criteria relative to bike paths carried over highway bridges.

Bike paths immediately adjacent to streets and highways are not recommended. They should not be considered a substitute for the street, because many bicyclists will find it less convenient to ride on these types of facilities as compared with the streets, particularly for utility trips.

(6) *Bike Paths in the Median of Highways*. As a general rule, bike paths in the median of highways are not recommended because they require movements contrary to normal rules of the road. Specific problems with such facilities include:

(a) Bicyclist right turns from the center of roadways are unnatural for bicyclists and confusing to motorists.

(b) Proper bicyclist movements through intersections with signals are unclear.

(c) Left-turning motorists must cross one direction of motor vehicle traffic and two directions of bicycle traffic, which increases conflicts.

(d) Where intersections are infrequent, bicyclists will enter or exit bike paths at midblock.

(e) Where medians are landscaped, visual relationships between bicyclists and motorists at intersections are impaired.

For the above reasons, bike paths in the median of highways should be considered only when the above problems can be avoided. **Bike paths shall not be designed in the medians of freeways or expressways.**

(7) Design Speed. The proper design speed for a bike path is dependent on the expected type of use and on the terrain. **The minimum design speed for bike paths shall be 40 km/h except as noted in Table 1003.1.**

Table 1003.1

Bike Path Design Speeds

Type of Facility	Design Speed (km/h)
Bike Paths with Mopeds Prohibited	40
Bike Paths with Mopeds Permitted	50
Bike Paths on Long Downgrades (steeper than 4%, and longer than 150 m)	50

Installation of "speed bumps" or other similar surface obstructions, intended to cause bicyclists to slow down in advance of intersections or other geometric constraints, shall not be used. These devices cannot compensate for improper design.

(8) Horizontal Alignment and Superelevation. The minimum radius of curvature negotiable by a bicycle is a function of the superelevation rate of the bicycle path surface, the coefficient of friction between the bicycle tires and the bicycle path surface, and the speed of the bicycle.

For most bicycle path applications the superelevation rate will vary from a minimum of 2 percent (the minimum necessary to encourage adequate drainage) to a maximum of approximately 5 percent (beyond which maneuvering difficulties by slow bicyclists and adult tricyclists might be expected). A straight 2% cross slope is recommended on tangent sections. The minimum superelevation rate of 2% will be adequate for most conditions and will simplify construction. Superelevation rates steeper than 5 percent should be avoided on bike paths expected to have adult tricycle traffic.

The coefficient of friction depends upon speed; surface type, roughness, and condition; tire type and condition; and whether the surface is wet or dry. Friction factors used for design should be selected based upon the point at which centrifugal force causes the bicyclist to recognize a feeling of discomfort and instinctively act to avoid higher speed. Extrapolating from values used in highway design, design friction factors for paved bicycle paths can be assumed to vary from 0.31 at 20 km/h to 0.21 at 50 km/h. Although there is no data available for unpaved surfaces, it is suggested that friction factors be reduced by 50 percent to allow a sufficient margin of safety.

The minimum radius of curvature can be selected from Figure 1003.1C. When curve radii smaller than those shown in Figure 1003.1C must be used on bicycle paths because of right of way, topographical or other considerations, standard curve warning signs and supplemental pavement markings should be installed. The negative effects of nonstandard curves can also be partially offset by widening the pavement through the curves.

(9) Stopping Sight Distance. To provide bicyclists with an opportunity to see and react to the unexpected, a bicycle path should be designed with adequate stopping sight distances. The distance required to bring a bicycle to a full controlled stop is a function of the bicyclist's perception and brake reaction time, the initial speed of the bicycle, the coefficient of friction between the tires and the pavement, and the braking ability of the bicycle.

Figure 1003.1D indicates the minimum stopping sight distances for various design speeds and grades. For two-way bike paths, the descending direction, that is, where "G" is negative, will control the design.

Figure 1003.1C

Curve Radii & Superelevations

$$R = \frac{V^2}{127\left(\frac{e}{100} + f\right)}$$

where,

R = Minimum radius of curvature (m),

V = Design Speed (km/h),

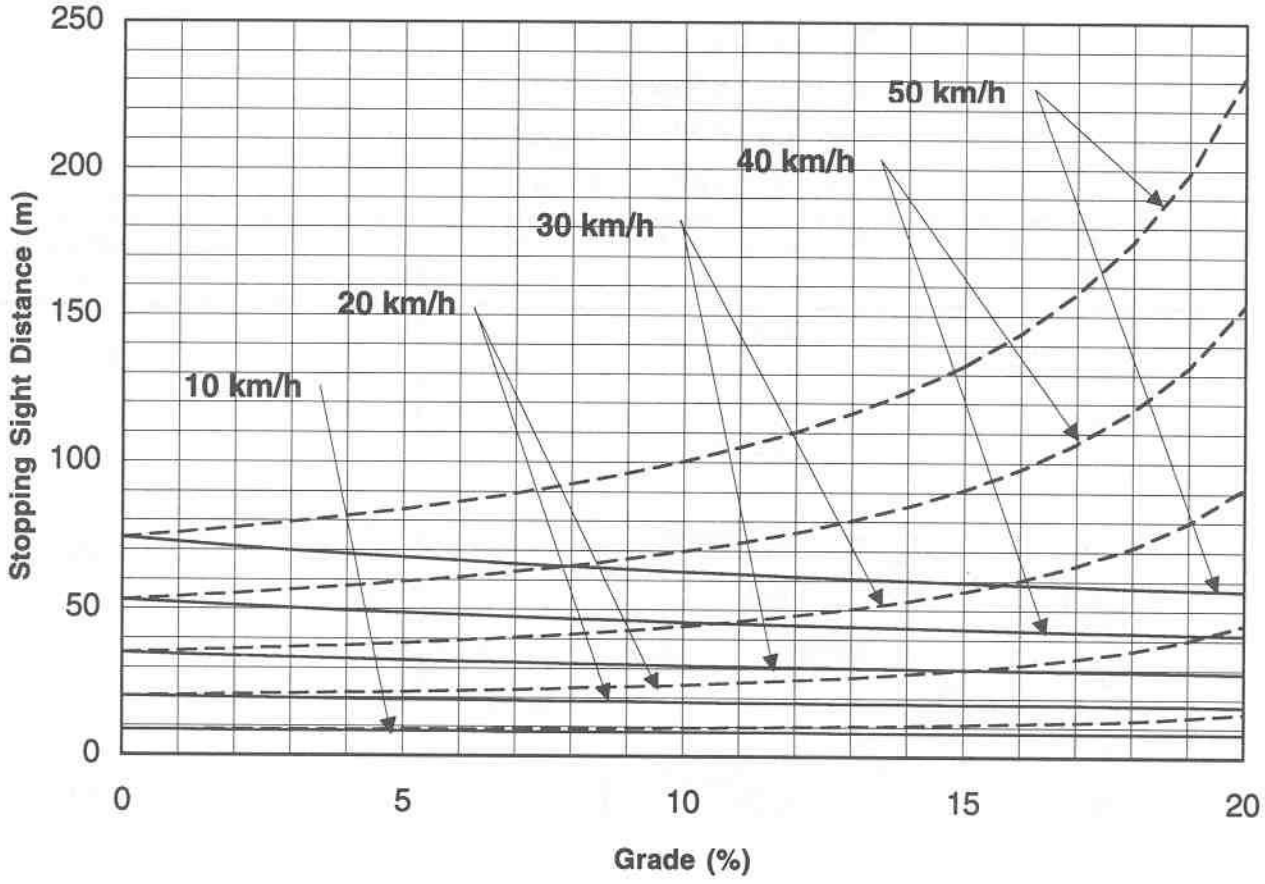
e = Rate of bikeway superelevation, percent

f = Coefficient of friction

Design Speed-V (km/h)	Friction Factor-f	Superelevation-e (%)	Minimum Radius-R (m)
20	0.31	2	10
30	0.28	2	24
40	0.25	2	47
50	0.21	2	86
20	0.31	3	9
30	0.28	3	23
40	0.25	3	45
50	0.21	3	82
20	0.31	4	9
30	0.28	4	22
40	0.25	4	43
50	0.21	4	79
20	0.31	5	9
30	0.28	5	21
40	0.25	5	42
50	0.21	5	76

Figure 1003.1D

Stopping Sight Distance



$$S = \frac{V^2}{254\,(f \pm G)} + \frac{V}{1.4}$$

Descend - - - - - -
Ascend ———

Where : S = stopping sight, m

V = velocity, km/h

f = coefficient of friction (use 0.25)

G = grade, m/m (rise/run)

(10) *Length of Crest Vertical Curves*. Figure 1003.1E indicates the minimum lengths of crest vertical curves for varying design speeds.

(11) *Lateral Clearance on Horizontal Curves*. Figure 1003.1F indicates the minimum clearances to line of sight obstructions for horizontal curves. The required lateral clearance is obtained by entering Figure 1003.1F with the stopping sight distance from Figure 1003.1D and the proposed horizontal curve radius.

Bicyclists frequently ride abreast of each other on bicycle paths, and on narrow bicycle paths, bicyclists have a tendency to ride near the middle of the path. For these reasons, and because of the serious consequences of a head on bicycle accident, lateral clearances on horizontal curves should be calculated based on the sum of the stopping sight distances for bicyclists traveling in opposite directions around the curve. Where this is not possible or feasible, consideration should be given to widening the path through the curve, installing a yellow center line, installing a curve warning sign, or some combination of these alternatives.

(12) *Grades*. Bike paths generally attract less skilled bicyclists, so it is important to avoid steep grades in their design. Bicyclists not physically conditioned will be unable to negotiate long, steep uphill grades. Since novice bicyclists often ride poorly maintained bicycles, long downgrades can cause problems. For these reasons, bike paths with long, steep grades will generally receive very little use. The maximum grade rate recommended for bike paths is 5%. It is desirable that sustained grades be limited to 2% if a wide range of riders is to be accommodated. Steeper grades can be tolerated for short segments (e.g., up to about 150 m). Where steeper grades are necessitated, the design speed should be increased and additional width should be provided for maneuverability.

(13) *Pavement Structure*. The pavement structure of a bike path should be designed in the same manner as a highway, with consideration given to the quality of the basement soil and the anticipated loads the bikeway will experience. It is important to construct and maintain a smooth riding surface with skid resistant qualities. Principal loads will normally be from maintenance and emergency vehicles. Expansive soil should be given special consideration and will probably require a special structural section. A minimum pavement thickness of 50 mm of asphalt concrete is recommended. Type "A" or "B" asphalt concrete (as described in Department of Transportation Standard Specifications), with 12.5 mm maximum aggregate and medium grading is recommended. Consideration should be given to increasing the asphalt content to provide increased pavement life. Consideration should also be given to sterilization of basement soil to preclude possible weed growth through the pavement.

At unpaved highway or driveway crossings of bicycle paths, the highway or driveway should be paved a minimum of 3 m on each side of the crossing to reduce the amount of gravel being scattered along the path by motor vehicles. The pavement structure at the crossing should be adequate to sustain the expected loading at that location.

(14) *Drainage*. For proper drainage, the surface of a bike path should have a cross slope of 2%. Sloping in one direction usually simplifies longitudinal drainage design and surface construction, and accordingly is the preferred practice. Ordinarily, surface drainage from the path will be adequately dissipated as it flows down the gently sloping shoulder. However, when a bike path is constructed on the side of a hill, a drainage ditch of suitable dimensions may be necessary on the uphill side to intercept the hillside drainage. Where necessary, catch basins with drains should be provided to carry intercepted water across the path. Such ditches should be designed in such a way that no undue obstacle is presented to bicyclists.

Culverts or bridges are necessary where a bike path crosses a drainage channel.

Figure 1003.1E

Minimum Length of Crest Vertical Curve (L) Based on Stopping Sight Distance (S)

$L = 2S - \frac{450}{A}$ when S>L

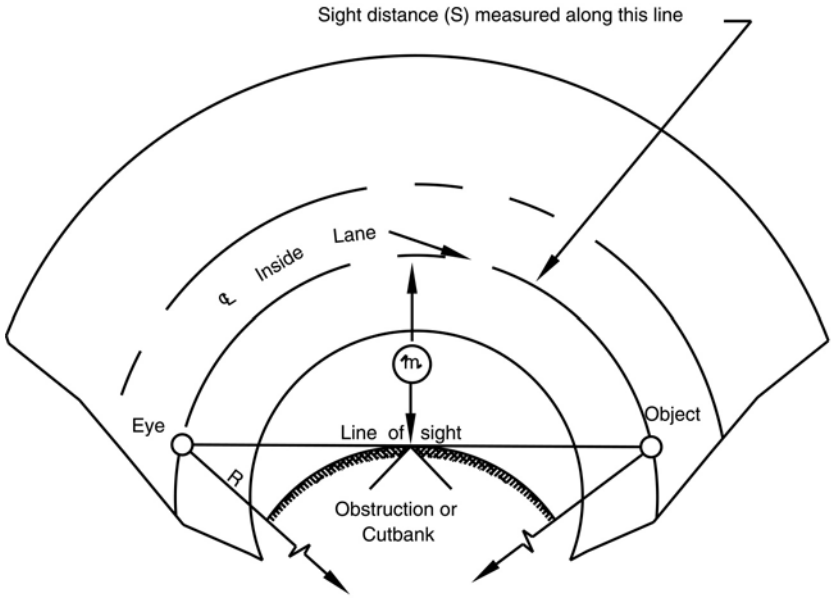
$L = \frac{AS^2}{450}$ when S<L

Double line represents S = L
L = Minimum length of vertical curve - meters
A = Algebraic grade difference - %
S = Stopping sight distance - meters
See Figure1003.1D to determine "S" for a given design speed "V"

Height of cyclist eye - 1400 mm Height of object - 100 mm

A	S = Stopping Sight Distance (m)										
(%)	15	20	25	30	35	40	45	50	55	60	
5								10.0	20.0	30.0	
6						5.0	15.0	25.0	35.0	45.0	
7		**S>L**			5.7	15.7	25.7	35.7	45.7	55.7	
8				3.8	13.8	23.8	33.8	43.8	53.8	64.0	
9				10.0	20.0	30.0	40.0	50.0	60.5	72.0	
10			5.0	15.0	25.0	35.0	45.0	55.6	67.2	80.0	
11			9.1	19.1	29.1	39.1	49.5	61.1	73.9	88.0	
12		2.5	12.5	22.5	32.5	42.7	54.0	66.7	80.7	96.0	
13		5.4	15.4	25.4	35.4	46.2	58.5	72.2	87.4	104.0	
14		7.9	17.9	27.9	38.1	49.8	63.0	77.8	94.1	112.0	
15		10.0	20.0	30.0	40.8	53.3	67.5	83.3	100.8	120.0	
16	1.9	11.9	21.9	32.0	43.6	56.9	72.0	88.9	107.6	128.0	
17	3.5	13.5	23.5	34.0	46.3	60.4	76.5	94.4	114.3	136.0	
18	5.0	15.0	25.0	36.0	49.0	64.0	81.0	100.0	121.0	144.0	
19	6.3	16.3	26.4	38.0	51.7	67.6	85.5	105.6	127.7	152.0	**S<L**
20	7.5	17.5	27.8	40.0	54.4	71.1	90.0	111.1	134.4	160.0	
21	8.6	18.6	29.2	42.0	57.2	74.7	94.5	116.7	141.2	168.0	
22	9.5	19.5	30.6	44.0	59.9	78.2	99.0	122.2	147.9	176.0	
23	10.4	20.4	31.9	46.0	62.6	81.8	103.5	127.8	154.6	184.0	
24	11.3	21.3	33.3	48.0	65.3	85.3	108.0	133.3	161.3	192.0	
25	12.0	22.2	34.7	50.0	68.1	88.9	112.5	138.9	168.1	200.0	

Figure 1003.1F
Lateral Clearances on Horizontal Curves



S = Sight distance in meters.
R = Radius of ℄ of lane in meters.
m = Distance from ℄ of lane in meters.
V = Design speed for S in km/h.
(Refer to Figure 1003.1D to determine "V", after "S" is determined.)

Angle is expressed in degrees

$$m = R\left[1-\cos\left(\frac{28.65S}{R}\right)\right]$$

$$S = \frac{R}{28.65}\left[\cos^{-1}\left(\frac{R-m}{R}\right)\right]$$

Formula applies only when S is equal to or less than length of curve.

Line of sight is 600 mm above ℄ inside lane at point of obstruction.

GIVEN "R" AND "S"; FIND "m"

R (m)	S=10 m *m* meters	S=20 m *m* meters	S=30 m *m* meters	S=40 m *m* meters	S=50 *m* meters	S=60 m *m* meters	S=70 m *m* meters	S=80 m *m* meters	S=90 m *m* meters	S=100 m *m* meters	S=110 m *m* meters
25	0.50	1.97	4.37	7.58	11.49	15.94	20.75	25.73	30.68	35.41	39.72
50	0.25	1.00	2.23	3.95	6.12	8.73	11.76	15.17	18.92	22.99	27.32
75	0.17	0.67	1.50	2.65	4.13	5.92	8.02	10.42	13.10	16.06	19.28
100	0.12	0.50	1.12	1.99	3.11	4.47	6.06	7.90	9.96	12.24	14.75
125	0.10	0.40	0.90	1.60	2.49	3.58	4.87	6.35	8.01	9.87	11.91
150	0.08	0.33	0.75	1.33	2.08	2.99	4.07	5.30	6.70	8.26	9.97
175	0.07	0.29	0.64	1.14	1.78	2.57	3.49	4.55	5.75	7.10	8.57
200	0.06	0.25	0.56	1.00	1.56	2.25	3.06	3.99	5.04	6.22	7.52
225	0.06	0.22	0.50	0.89	1.39	2.00	2.72	3.55	4.49	5.53	6.69
250	0.05	0.20	0.45	0.80	1.25	1.80	2.45	3.19	4.04	4.98	6.03
275	0.05	0.18	0.41	0.73	1.14	1.63	2.22	2.90	3.67	4.53	5.48
300	0.04	0.17	0.37	0.67	1.04	1.50	2.04	2.66	3.37	4.16	5.03
350	0.04	0.14	0.32	0.57	0.89	1.29	1.75	2.28	2.89	3.57	4.31
400	0.03	0.13	0.28	0.50	0.78	1.12	1.53	2.00	2.53	3.12	3.78
500	0.03	0.10	0.23	0.40	0.62	0.90	1.22	1.60	2.02	2.50	3.02
600	0.02	0.08	0.19	0.33	0.52	0.75	1.02	1.33	1.69	2.08	2.52
700	0.02	0.07	0.16	0.29	0.45	0.64	0.87	1.14	1.45	1.79	2.16
800	0.02	0.06	0.14	0.25	0.39	0.56	0.77	1.00	1.27	1.56	1.89
900	0.01	0.06	0.13	0.22	0.35	0.50	0.68	0.89	1.12	1.39	1.68
1000	0.01	0.05	0.11	0.20	0.31	0.45	0.61	0.80	1.01	1.25	1.51

Figure 1003.1F

Lateral Clearances on Horizontal Curves (continued)

GIVEN "R" AND "m"; FIND "S"

R (m)	*m* = 1 meter	*m* = 2 meters	*m* = 3 meters	*m* = 4 meters	*m* = 5 meters	*m* = 6 meters	*m* = 7 meters	*m* = 8 meters	*m* = 9 meters	*m* = 10 meters	*m* = 11 meters
	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)
25	14.19	20.13	24.74	28.67	32.17	35.37	38.35	41.15	43.81	46.36	48.82
50	20.03	28.38	34.81	40.27	45.10	49.49	53.55	57.35	60.93	64.35	67.61
75	24.52	34.72	42.57	49.21	55.08	60.40	65.32	69.91	74.23	78.34	82.26
100	28.31	40.06	49.11	56.75	63.51	69.63	75.27	80.54	85.50	90.20	94.68
125	31.64	44.78	54.88	63.41	70.94	77.77	84.06	89.92	95.44	100.67	105.66
150	34.66	49.04	60.10	69.43	77.67	85.13	92.00	98.41	104.44	110.15	115.60
175	37.43	52.96	64.90	74.97	83.86	91.91	99.32	106.23	112.73	118.88	124.75
200	40.01	56.61	69.36	80.13	89.62	98.22	106.13	113.51	120.45	127.01	133.27
225	42.44	60.04	73.56	84.97	95.04	104.15	112.53	120.35	127.70	134.66	141.28
250	44.73	63.28	77.53	89.56	100.16	109.76	118.59	126.82	134.56	141.89	148.86
275	46.91	66.37	81.31	93.92	105.03	115.09	124.35	132.98	141.09	148.77	156.08
300	49.00	69.32	84.92	98.08	109.69	120.19	129.86	138.86	147.33	155.34	162.97
350	52.92	74.86	91.71	105.92	118.45	129.79	140.22	149.94	159.08	167.72	175.95
400	56.58	80.03	98.03	113.22	126.61	138.73	149.87	160.26	170.01	179.25	188.04
500	63.25	89.47	109.59	126.57	141.53	155.06	167.52	179.11	190.01	200.32	210.13
600	69.29	98.00	120.04	138.63	155.02	169.83	183.47	196.16	208.09	219.38	230.12
700	74.84	105.85	129.65	149.73	167.42	183.42	198.14	211.85	224.72	236.91	248.50
800	80.00	113.15	138.60	160.05	178.97	196.07	211.80	226.45	240.21	253.23	265.62
900	84.85	120.01	147.00	169.76	189.81	207.95	224.63	240.16	254.75	268.56	281.69
1000	89.44	126.50	154.95	178.93	200.07	219.18	236.76	253.13	268.51	283.06	296.90

(15) *Barrier Posts*. It may be necessary to install barrier posts at entrances to bike paths to prevent motor vehicles from entering. For barrier post placement, visibility marking, and pavement markings, see the MUTCD and California Supplement, Section 9C.101.

Generally, barrier configurations that preclude entry by motorcycles present safety and convenience problems for bicyclists. Such devices should be used only where extreme problems are encountered.

(16) *Lighting*. Fixed-source lighting reduces conflicts along paths and at intersections. In addition, lighting allows the bicyclist to see the bicycle path direction, surface conditions, and obstacles. Lighting for bicycle paths is important and should be considered where riding at night is expected, such as bicycle paths serving college students or commuters, and at highway intersections. Lighting should also be considered through underpasses or tunnels, and when nighttime security could be a problem.

Depending on the location, average maintained horizontal illumination levels of 5 lux to 22 lux should be considered. Where special security problems exist, higher illumination levels may be considered. Light standards (poles) should meet the recommended horizontal and vertical clearances. Luminaires and standards should be at a scale appropriate for a pedestrian or bicycle path.

1003.2 Class II Bikeways

Class II bikeways (bike lanes) for preferential use by bicycles are established within the paved area of highways. Bike lane pavement markings are intended to promote an orderly flow of traffic, by establishing specific lines of demarcation between areas reserved for bicycles and lanes to be occupied by motor vehicles. This effect is supported by bike lane signs and pavement markings. Bike lane pavement markings can increase bicyclists' confidence that motorists will not stray into their path of travel if they remain within the bike lane. Likewise, with more certainty as to where bicyclists will be, passing motorists are less apt to swerve toward opposing traffic in making certain they will not hit bicyclists.

Class II bike lanes shall be one-way facilities. Two-way bike lanes (or bike paths that are contiguous to the roadway) are not permitted, as such facilities have proved unsatisfactory and promote riding against the flow of motor vehicle traffic.

(1) *Widths*. Typical Class II bikeway configurations are illustrated in Figure 1003.2A and are described below:

(a) Figure 1003.2A-(1) depicts bike lanes on an urban type curbed street where parking stalls (or continuous parking stripes) are marked. Bike lanes are located between the parking area and the traffic lanes. **As indicated, 1.5 m shall be the minimum width of bike lane where parking stalls are marked.** If parking volume is substantial or turnover high, an additional 0.3 m to 0.6 m of width is desirable.

Bike lanes shall not be placed between the parking area and the curb. Such facilities increase the conflict between bicyclists and opening car doors and reduce visibility at intersections. Also, they prevent bicyclists from leaving the bike lane to turn left and cannot be effectively maintained.

(b) Figure 1003.2A-(2) depicts bike lanes on an urban-type curbed street, where parking is permitted, but without parking stripe or stall marking. Bike lanes are established in conjunction with the parking areas. **As indicated, 3.3 m or 3.6 m (depending on the type of curb) shall be the minimum width of the bike lane where parking is permitted.** This type of lane is satisfacory where parking is not extensive and where turnover of parked cars is infrequent. However, if parking is substantial, turnover of parked cars is high, truck traffic is substantial, or if vehicle speeds exceed 55 km/h, additional width is recommended.

(c) Figure 1003.2A-(3) depicts bike lanes along the outer portions of an urban type curbed street, where parking is prohibited. This is generally the most desirable configuration for bike lanes, as it eliminates potential conflicts resulting from auto parking (e.g.,

opening car doors). **As indicated, if no gutter exists, the minimum bike lane width shall be 1.2 m. With a normal 600 mm gutter, the minimum bike lane width shall be 1.5 m.** The intent is to provide a minimum 1.2 m wide bike lane, but with at least 0.9 m between the traffic lane and the longitudinal joint at the concrete gutter, since the gutter reduces the effective width of the bike lane for two reasons. First, the longitudinal joint may not always be smooth, and may be difficult to ride along. Secondly, the gutter does not provide a suitable surface for bicycle travel. Where gutters are wide (say, 1.2 m), an additional 0.9 m must be provided because bicyclists should not be expected to ride in the gutter. Wherever possible, the width of bike lanes should be increased to 1.8 to 2.4 m to provide for greater safety. 2.4 m bike lanes can also serve as emergency parking areas for disabled vehicles.

Striping bike lanes next to curbs where parking is prohibited only during certain hours shall be done only in conjunction with special signing to designate the hours bike lanes are to be effective. Since the Vehicle Code requires bicyclists to ride in bike lanes where provided (except under certain conditions), proper signing is necessary to inform bicyclists that they are required to ride in bike lanes only during the course of the parking prohibition. This type of bike lane should be considered only if the vast majority of bicycle travel would occur during the hours of the parking prohibition, and only if there is a firm commitment to enforce the parking prohibition. Because of the obvious complications, this type of bike lane is not encouraged for general application.

Figure 1003.2A(4) depicts bike lanes on a highway without curbs and gutters. This location is in an undeveloped area where infrequent parking is handled off the pavement. This can be accomplished by supplementing the bike lane signing with R25 (park off pavement) signs, or R26 (no parking) signs. **Minimum widths shall be as shown.** Additional width is desirable, particularly where motor vehicle speeds exceed 55 km/h.

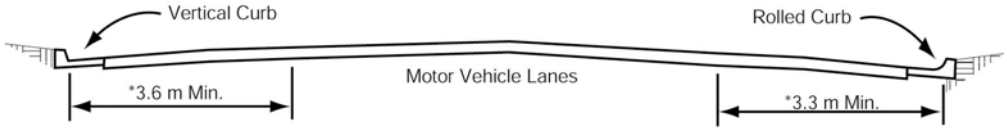
Per Topic 301, the minimum lane width standard is 3.6 m. There are situations where it may be desirable to reduce the width of the traffic lanes in order to add or widen bicycle lanes or shoulders. In determining the appropriateness of narrower traffic lanes, consideration should be given to factors such as motor vehicle speeds, truck volumes, alignment, bicycle lane width, sight distance, and the presence of on-street vehicle parking when vehicle parking is permitted adjacent to a bicycle lane, or on a shoulder where bicycling is not prohibited, reducing the width of the adjacent traffic lane may allow for wider bicycle lanes or shoulders, to provide greater clearance between bicyclists and driver-side doors when opened. Where favorable conditions exist, traffic lanes of 3.3 m may be feasible but must be approved per Topic 301.

Bike lanes are not advisable on long, steep downgrades, where bicycle speeds greater than 50 km/h are expected. As grades increase, downhill bicycle speeds will increase, which increases the problem of riding near the edge of the roadway. In such situations, bicycle speeds can approach those of motor vehicles, and experienced bicyclists will generally move into the motor vehicle lanes to increase sight distance and maneuverability. If bike lanes are to be marked, additional width should be provided to accommodate higher bicycle speeds.

If the bike lanes are to be located on one-way streets, they should be placed on the right side of the street. Bike lanes on the left side would cause bicyclists and motorists to undertake crossing maneuvers in making left turns onto a two-way street.

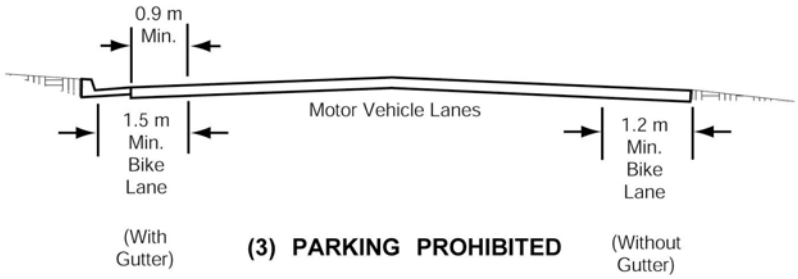
Figure 1003.2A
Typical Bike Lane Cross Sections
(On 2-lane or Multilane Highways)

(1) MARKED PARKING

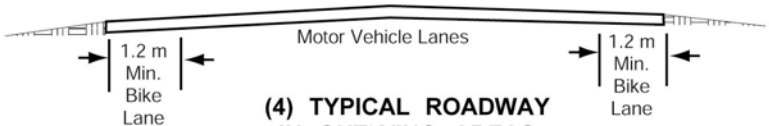


* 3.9 is recommended where there is substantial parking or turnover of parked cars is high (e.g. commerical areas).

(2) PARKING PERMITTED WITHOUT MARKED PARKING OR STALL



(3) PARKING PROHIBITED



(4) TYPICAL ROADWAY IN OUTLYING AREAS PARKING RESTRICTED

Note: For pavement marking guidance, see the MUTCD and California Supplement, Section 9C.04

(2) *Signing and Pavement Markings*. Details for signing and pavement marking of Class II bikeways are found in the MUTCD and California Supplement, Section 9C.04.

(3) *At-grade Intersection Design*. Most auto/bicycle accidents occur at intersections. For this reason, bikeway design at intersections should be accomplished in a manner that will minimize confusion by motorists and bicyclists, and will permit both to operate in accordance with the normal rules of the road.

Figure 1003.2B illustrates a typical at-grade intersection of multilane streets, with bike lanes on all approaches. Some common movements of motor vehicles and bicycles are shown. A prevalent type of accident involves straight-through bicycle traffic and right-turning motorists. Left-turning bicyclists also have problems, as the bike lane is on the right side of the street, and bicyclists have to cross the path of cars traveling in both directions. Some bicyclists are proficient enough to merge across one or more lanes of traffic, to use the inside lane or left-turn lane. However, there are many who do not feel comfortable making this maneuver. They have the option of making a two-legged left turn by riding along a course similar to that followed by pedestrians, as shown in the diagram. Young children will often prefer to dismount and change directions by walking their bike in the crosswalk.

(4) *Interchange Design*. As with bikeway design through at-grade intersections, bikeway design through interchanges should be accomplished in a manner that will minimize confusion by motorists and bicyclists. Designers should work closely with the local agency in designing bicycle facilities through interchanges. Local Agencies should carefully select interchange locations which are most suitable for bikeway designations and where the crossing meets applicable design standards. The local agency may have special needs and desires for continuity through interchanges which should be considered in the design process.

For Class II bikeway signing and lane markings, see the MUTCD and California Supplement, Section 9C.04.

The shoulder width shall not be reduced through the interchange area. The minimum shoulder width shall match the approach roadway shoulder width, but not less than 1.2 m or 1.5 m if a gutter exists. If the shoulder width is not available, the designated bike lane shall end at the previous local road intersection.

Depending on the intersection angles, either Figure 1003.2C or 1003.2D should also be used for multilane ramp intersections. Additionally, the outside through lane should be widened to 4.2 m when feasible. This allows extra room for bicycles to share the through lane with vehicles. The outside shoulder width should not be reduced through the interchange area to accommodate this additional width.

1003.3 Class III Bikeways

Class III bikeways (bike routes) are intended to provide continuity to the bikeway system. Bike routes are established along through routes not served by Class I or II bikeways, or to connect discontinuous segments of bikeway (normally bike lanes). Class III facilities are shared facilities, either with motor vehicles on the street, or with pedestrians on sidewalks, and in either case bicycle usage is secondary. Class III facilities are established by placing Bike Route signs along roadways.

Minimum widths for Class III bikeways are not presented, as the acceptable width is dependent on many factors, including the volume and character of vehicular traffic on the road, typical speeds, vertical and horizontal alignment, sight distance, and parking conditions.

Since bicyclists are permitted on all highways (except prohibited freeways), the decision to designate the route as a bikeway should be based on the advisability of encouraging bicycle travel on the route and other factors listed below.

Figure 1003.2B

Typical Bicycle/Auto Movements at Intersections of Multilane Streets

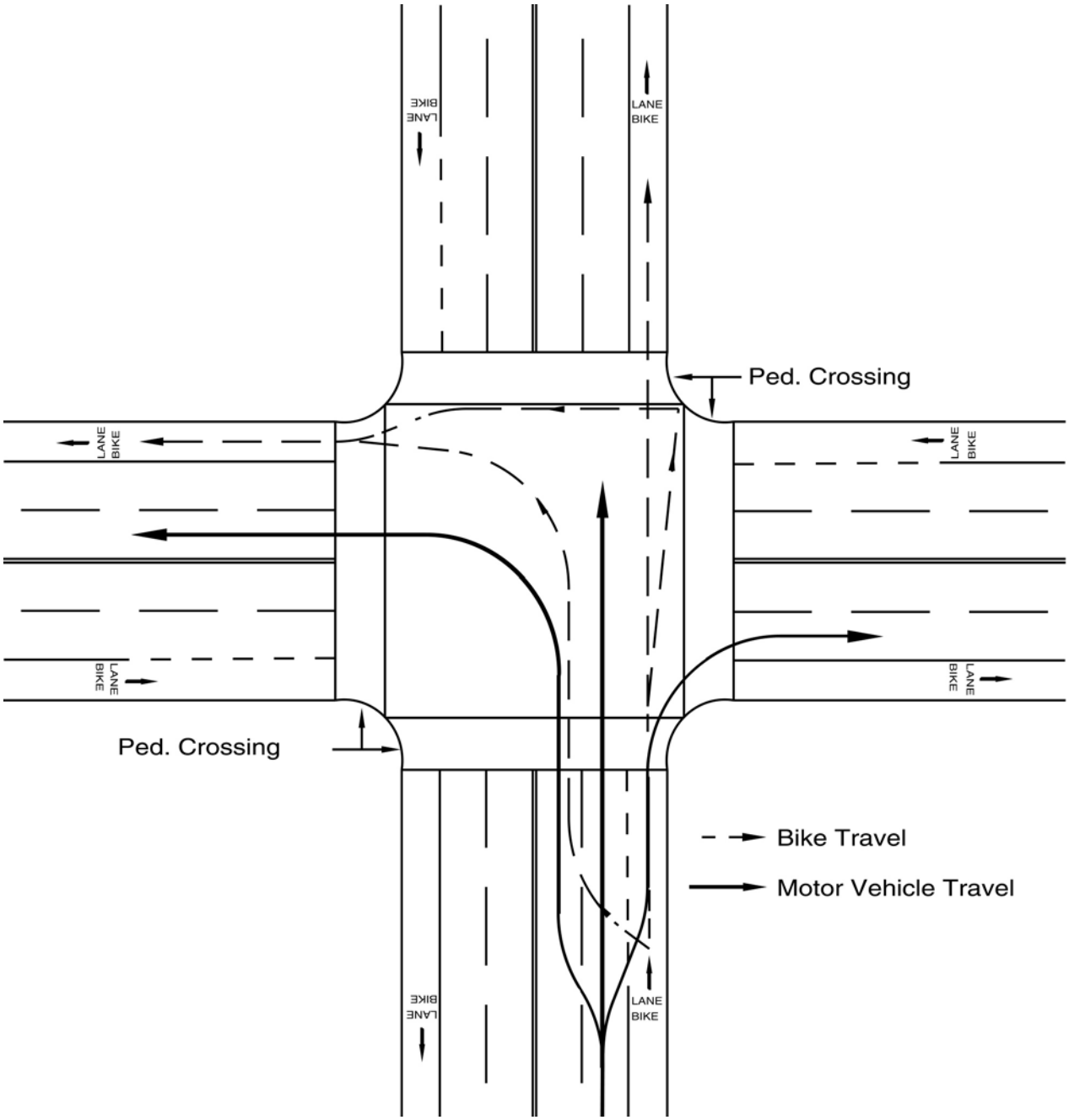
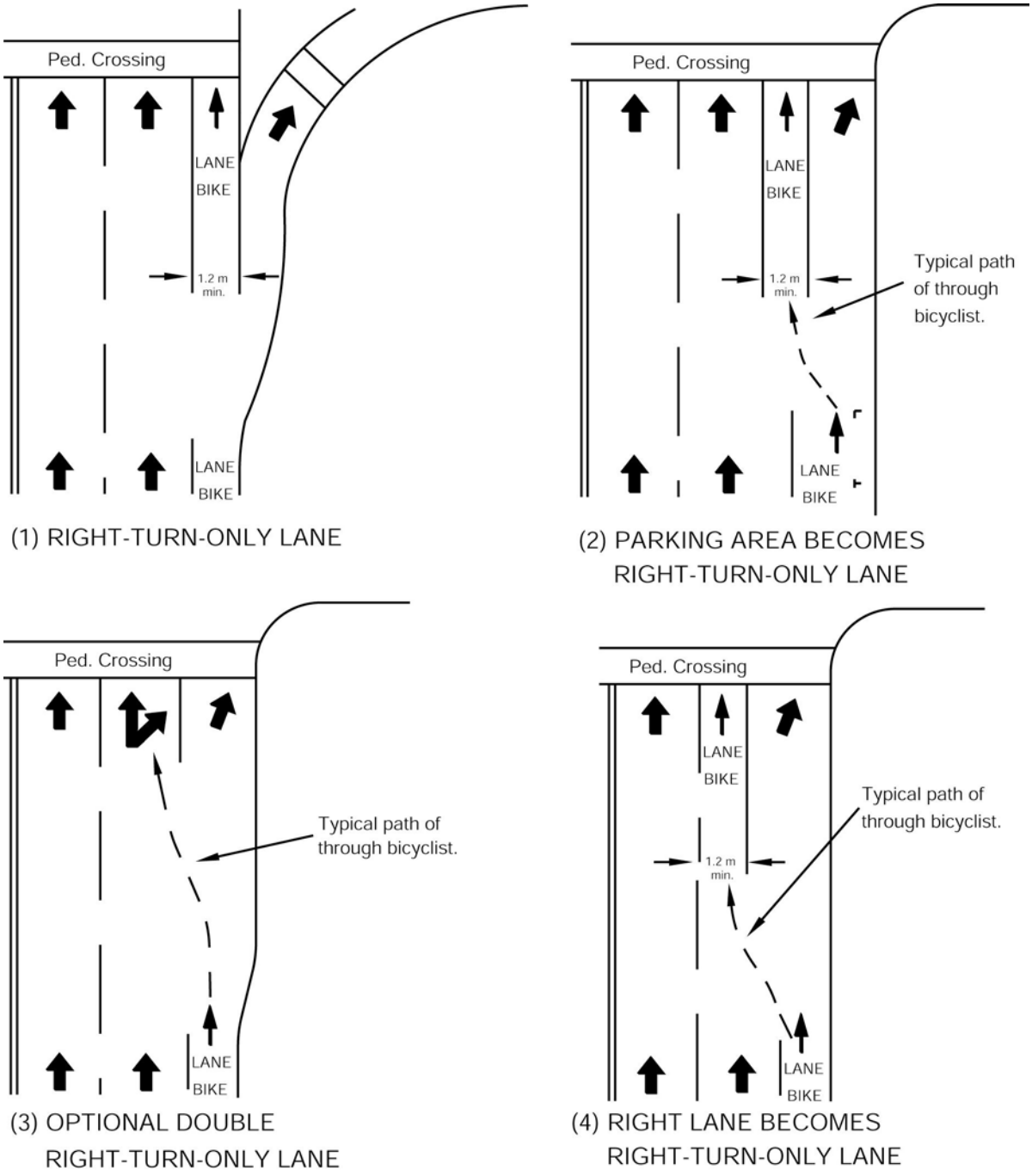
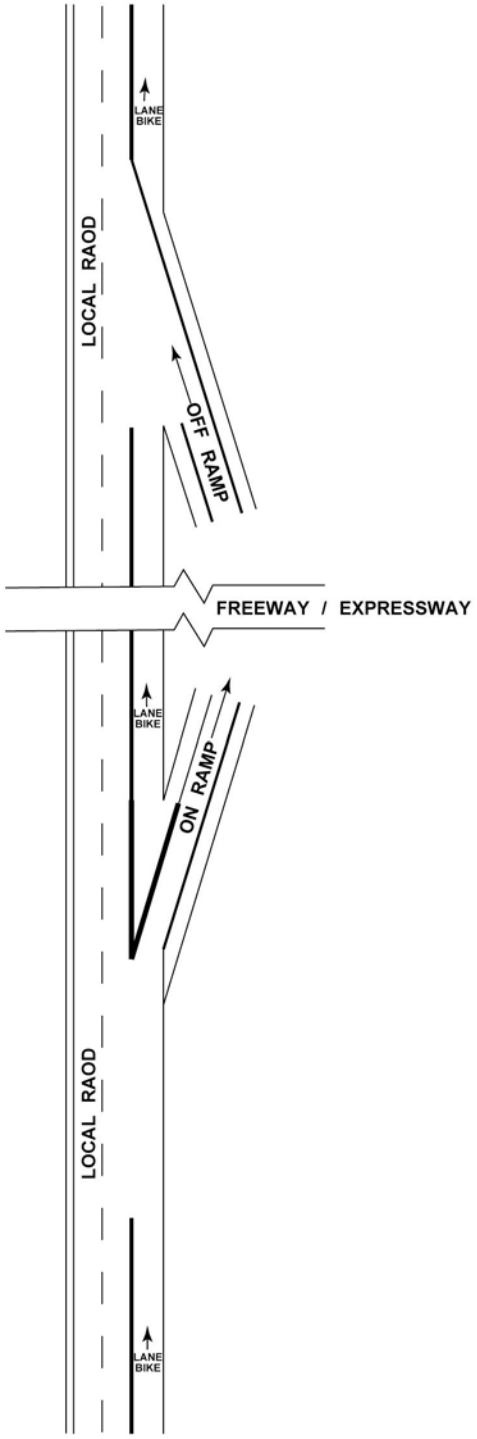


Figure 1003.2C
Bike Lanes Approaching Motorist
Right-turn-only Lane



Note: For bicycle lane markings, see the MUTCD and California Supplement, Section 9C.04.

Figure 1003.2D
Bike Lanes Through Interchanges



Notes:

1.) See Index 1003.2 (4) for additional information.

2.) The shoulder width shall not be reduced through the interchange area. The minimum shoulder width shall match the approach roadway shoulder width, but not less than 1.2 m or 1.5 m if a gutter exists. If the shoulder width is not available, the designated bike lane shall end at the previous local raod intersection.

3.) See Index 1003.3 (4) for information on Bike Routes Through Interchanges.

(1) On-street Bike Route Criteria. To be of benefit to bicyclists, bike routes should offer a higher degree of service than alternative streets. Routes should be signed only if some of the following apply:

(a) They provide for through and direct travel in bicycle-demand corridors.

(b) Connect discontinuous segments of bike lanes.

(c) An effort has been made to adjust traffic control devices (stop signs, signals) to give greater priority to bicyclists, as compared with alternative streets. This could include placement of bicycle-sensitive detectors on the right-hand portion of the road, where bicyclists are expected to ride.

(d) Street parking has been removed or restricted in areas of critical width to provide improved safety.

(e) Surface imperfections or irregularities have been corrected (e.g., utility covers adjusted to grade, potholes filled, etc.).

(f) Maintenance of the route will be at a higher standard than that of other comparable streets (e.g., more frequent street sweeping).

(2) Sidewalk Bikeway Criteria. In general, the designated use of sidewalks (as a Class III bikeway) for bicycle travel is unsatisfactory.

It is important to recognize that the development of extremely wide sidewalks does not necessarily add to the safety of sidewalk bicycle travel, as wide sidewalks will encourage higher speed bicycle use and can increase potential for conflicts with motor vehicles at intersections, as well as with pedestrians and fixed objects.

Sidewalk bikeways should be considered only under special circumstances, such as:

(a) To provide bikeway continuity along high speed or heavily traveled roadways having inadequate space for bicyclists, and uninterrupted by driveways and intersections for long distances.

(b) On long, narrow bridges. In such cases, ramps should be installed at the sidewalk approaches. If approach bikeways are two-way, sidewalk facilities should also be two-way.

Whenever sidewalk bikeways are established, a special effort should be made to remove unnecessary obstacles. Whenever bicyclists are directed from bike lanes to sidewalks, curb cuts should be flush with the street to assure that bicyclists are not subjected to problems associated with crossing a vertical lip at a flat angle. Also curb cuts at each intersection are necessary. Curb cuts should be wide enough to accommodate adult tricycles and two-wheel bicycle trailers.

In residential areas, sidewalk riding by young children too inexperienced to ride in the street is common. With lower bicycle speeds and lower auto speeds, potential conflicts are somewhat lessened, but still exist. Nevertheless, this type of sidewalk bicycle use is accepted. But it is inappropriate to sign these facilities as bikeways. Bicyclists should not be encouraged (through signing) to ride facilities that are not designed to accommodate bicycle travel.

(3) Destination Signing of Bike Routes. For Bike Route signs to be more functional, supplemental plates may be placed beneath them when located along routes leading to high demand destinations (e.g., "To Downtown"; "To State College"; etc. For typical signing, see the MUTCD and California Supplement, Figures 9B-5 and 9B-6.

There are instances where it is necessary to sign a route to direct bicyclists to a logical destination, but where the route does not offer any of the above listed bike route features. In such cases, the route should not be signed as a bike route; however, destination signing may be advisable. A typical application of destination signing would be where bicyclists are directed off a highway to bypass a section of freeway. Special signs would be placed to guide bicyclists to the next logical destination. The intent is to direct bicyclists in the same way as motorists would be directed if a highway detour was necessitated.

(4) Interchange Design As with bikeway design through at-grade inter sections, bikeway design through i nterchanges should be accom plished in a m anner that will m inimize confusion by motorists an d bicy clists. Designers should work closely with the local agency in designing bicycle facilities through interchanges. Local Agencies sh ould carefully select interchange locations which are most suitable for bikeway designations and where the crossing m eets applicable design standards. The local agency may have special ne eds and desir es for continuity th rough i nterchanges which should be considered in the design process.

Within the Interchange area the bike route shall require either an outside lane width of 4.8 m or a 3.6 m lane and a 1.2 m shoulder. If the above width is not available, the designated bike route shall end at the previous local road intersection.

1003.4 Bicycles on Freeways

In some instances, bicy clists ar e per mitted on freeways. Seldom would a freeway be designated as a bikeway, but it can be opened f or use if it meets cert ain criteria. Essentially , the criteria involve assessing the safety and convenience of the freeway as co mpared with available alternat e routes. However, a freeway sh ould not be opened to bicycle use if it is determined to be incompatible. The Headquarters Traffic Liaisons and the Design Coordinator must approve any pro posals to open freeways to bicyclists.

If a suitable alternate route exists, it would normally be unnecessary to open the free way. However, if the alternate route is unsuitable for bicycle travel the freeway m ay be a better alternative for bic yclists. In determining the suitability of an alternate route, safety should be the paramount consideration. The following factors should be considered:

- Number of intersections
- Shoulder widths
- Traffic volumes
- Vehicle speeds
- Bus, truck and recreational vehicle volumes
- Grades
- Travel time

When a suitable alternate route does not exist, a freeway shoulder m ay be considered for bic ycle travel. Normally, freeways in urban areas will have characteristics that make it unfeasible to per mit bicycle use. In determining if the freeway shoulder is suitable for bicy cle travel, the following factors should be considered;

- Shoulder widths
- Bicycle hazards on shoulders (drainage grates, expansion joints, etc.)
- Number and location of entrance/exit ramps
- Traffic volumes on entrance/exit ramps
- Bridge Railing height

When bic yclists are permitted on s egments of freeway, it will be necessary to modify and supplement freeway regul atory signs, particularly those at freeway ramp entrances and exits, see the MUTCD and California Supplem ent, Section 9B.101.

Where no rea sonable alternate route exists within a freeway corridor, the Department should coordinate with local ag encies to dev elop or im prove existing routes or pr ovide parallel bikeway s within or adjacent to the freeway right of way.

The long term goal is to provi de a safe and convenient non-freeway route for bicycle travel.

1003.5 Multipurpose Trails

In so me ins tances, it may be appropriate for agencies to develop multipurpose trails - for hikers, joggers, equestrians, bicy clists, etc. Many of these trails will not be paved and will n ot meet the standards for Class I bikeway s. As such, these facilities should not be signed as bikeways. Rather, they should be designated as multipurpose trails (or similar desig nation), alon g with regulator y signing to restrict motor vehicles, as appropriate.

If multipurpose trails are pri marily to serve bic ycle travel, they should be developed in accordance with standards fo r Class I bikeways. In general, multipurpose trails are not reco mmended as high speed transportation facilities for bicy clists because of conflicts between bicy clists and pedestrians.

Wherever possible, separate bicycle and pedestrian paths should be provided. If this is not feasible, additional width, signing and pavement markings should be used to minimize conflicts.

It is undesirable to mix mopeds and bicycles on the same facility. In general, mopeds should not be allowed on multipurpose trails because of conflicts with slower moving bicyclists and pedestrians. In some cases where an alternate route for mopeds does not exist, additional width, signing, and pavement markings should be used to minimize conflicts. Increased patrolling by law enforcement personnel is also recommended to enforce speed limits and other rules of the road.

It is usually not desirable to mix horses and bicycle traffic on the same multipurpose trail. Bicyclists are often not aware of the need for slower speeds and additional operating space near horses. Horses can be startled easily and may be unpredictable if they perceive approaching bicyclists as a danger. In addition, pavement requirements for safe bicycle travel are not suitable for horses. For these reasons, a bridle trail separate from the multipurpose trail is recommended wherever possible.

1003.6 Miscellaneous Bikeway Criteria

The following are miscellaneous bikeway criteria which should be followed to the extent pertinent to Class I, II and III bikeways. Some, by their very nature, will not apply to all classes of bikeway. Many of the criteria are important to consider on any highway where bicycle travel is expected, without regard to whether or not bikeways are established.

(1) Bridges. Bikeways on highway bridges must be carefully coordinated with approach bikeways to make sure that all elements are compatible. For example, bicycle traffic bound in opposite directions is best accommodated by bike lanes on each side of a highway. In such cases, a two-way bike path on one side of a bridge would normally be inappropriate, as one direction of bicycle traffic would be required to cross the highway at grade twice to get to and from the bridge bike path. Because of the inconvenience, many bicyclists will be encouraged to ride on the wrong side of the highway beyond the bridge termini.

The following criteria apply to a two-way bike path on one side of a highway bridge:

(a) The bikeway approach to the bridge should be by way of a separate two-way facility for the reason explained above.

(b) **A physical separation, such as a chain link fence or railing, shall be provided to offset the adverse effects of having bicycles traveling against motor vehicle traffic.** The physical separation should be designed to minimize fixed end hazards to motor vehicles and if the bridge is an interchange structure, to minimize sight distance restrictions at ramp intersections.

It is recommended that bikeway bridge railings or fences placed between traffic lanes and bikeways be at least 1.4 m high to minimize the likelihood of bicyclists falling over the railings. Standard bridge railings which are lower than 1.4 m can be retrofitted with lightweight upper railings or chain link fence suitable to restrain bicyclists. See Index 208.10(6) for guidance regarding bicycle railing on bridges.

Separate highway overcrossing structures for bikeway traffic shall conform to Caltrans' standard pedestrian overcrossing design loading. The minimum clear width shall be the paved width of the approach bikeway but not less than 2.4 m. If pedestrians are to use the structure, additional width is recommended.

(2) Surface Quality. The surface to be used by bicyclists should be smooth, free of potholes, and the pavement edge uniform. For rideability on new construction, the finished surface of bikeways should not vary more than 6 mm from the lower edge of a 2.4 m long straight edge when laid on the surface in any direction.

Table 1003.6 indicates the recommended bikeway surface tolerances for Class II and III bikeways developed on existing streets to minimize the potential for causing bicyclists to lose control of their bicycle (Note: Stricter tolerances should be achieved on new bikeway construction.) Shoulder rumble strips are not suitable as a riding surface for bicycles. See the MUTCD and California Supplement,

Chapter 3B for additional information regarding rumble strip design considerations for bicycles.

Table 1003.6
Bikeway Surface Tolerances

Direction of Travel	Grooves(1)	Steps(2)
Parallel to travel	No more than 12 mm wide	No more than 10 mm high
Perpendicular to travel	---	No more than 20 mm high

(1) Groove--A narrow slot in the surface that could catch a bicycle wheel, such as a gap between two concrete slabs.

(2) Step--A ridge in the pavement, such as that which might exist between the pavement and a concrete gutter or manhole cover; or that might exist between two pavement blankets when the top level does not extend to the edge of the roadway.

(3) Drainage Grates, Manhole Covers, and Driveways. Drainage inlet grates, manhole covers, etc., on bikeways should be designed and installed in a manner that provides an adequate surface for bicyclists. They should be maintained flush with the surface when resurfacing.

Drainage inlet grates on bikeways shall have openings narrow enough and short enough to assure bicycle tires will not drop into the grates (e.g., reticuline type), regardless of the direction of bicycle travel. Where it is not immediately feasible to replace existing grates with standard grates designed for bicycles, 25 mm x 6 mm steel cross straps should be welded to the grates at a spacing of 150 mm to 200 mm on centers to reduce the size of the openings adequately.

Corrective actions described above are recommended on all highways where bicycle travel is permitted, whether or not bikeways are designated.

Future driveway construction should avoid construction of a vertical lip from the driveway to the gutter, as the lip may create a problem for bicyclists when entering from the edge of the roadway at a flat angle. If a lip is deemed necessary, the height should be limited to 15 mm.

(4) At-grade Railroad Crossings and Cattle Guards. Whenever it is necessary to cross railroad tracks with a bikeway, special care must be taken to assure that the safety of bicyclists is protected. The bikeway crossing should be at least as wide as the approaches of the bikeway. Wherever possible, the crossing should be straight and at right angles to the rails. For on-street bikeways where a skew is unavoidable, the shoulder (or bike lane) should be widened, if possible, to permit bicyclists to cross at right angles (see Figure 1003.6A). If this is not possible, special construction and materials should be considered to keep the flangeway depth and width to a minimum.

Pavement should be maintained so ridge buildup does not occur next to the rails. In some cases, timber plank crossings can be justified and can provide for a smoother crossing. Where hazards to bicyclist cannot be avoided, appropriate signs should be installed to warn bicyclists of the danger.

All railroad crossings are regulated by the California Public Utilities Commission (CPUC). All new bike path railroad crossings must be approved by the CPUC. Necessary railroad protection will be determined based on a joint field review involving the applicant, the railroad company, and the CPUC.

The presence of cattle guards along any roadway where bicyclists are expected should be clearly marked with adequate advance warning.

(5) Obstruction Markings. Vertical barriers and obstructions, such as abutments, piers, and other features causing bikeway constriction, should be clearly marked to gain the attention of approaching bicyclists. This treatment should be used only where unavoidable, and is by no means a substitute for good bikeway design. See the MUTCD, Section 9C.06.

Figure 1003.6A
Railroad Crossings