CAPITAL IMPROVEMENT PROJECTS — Table 11-2

Proj.	Seg.	Class*	Feet	Miles	Description	Notes	Seg. Costs	Proj. Totals
A	1	Prop 3	1 485	0 28	Laguna Drive from State Street to Jefferson Street		$1 449	
	2	Prop 3	2 484	0 47	State Street from Grand Avenue to Carlsbad Boulevard		$1,449	
	3	Prop 3	3,150	0 60	Las Flores Drive from Jefferson Street to Highland Drive		$1 449	
	4	Prop 3	6 643	1 26	Highland Drive from Las Flores Drive to Chinquapin Avenue		$3 382	
	5	Prop 3	10 302	1 95	Chestnut Street from Carlsbad Boulevard to El Camino Real		$4 831	
	6	Prop 3	3 690	0 70	Chinquapin Avenue from Coastal Rail Trail to Highland Drive		$1 932	
	7	Prop 3	4 435	0 84	Adams Street from Chinquapin Avenue to Park Drive		$1 932	
	8	Prop 3	9 163	1 74	Park Drive from Tamarack Avenue to Kelly Drive		$4 348	
	9	Prop 3	1 718	0 33	Batiquitos Drive to end of Gabbiano Lane		$966	$21,738
B	10	Prop 2	2 500	0 47	Batiquitos Drive from Poinsettia Lane to Gabbiano Lane		$12 191	
	11	Prop 2	1,030	0 20	Camino de los Ondas from Hidden Valley Rd to Paseo del Norte		$8 406	$20,597
C	12	Prop 2	4 082	0 77	Carlsbad Village Drive from Carlsbad Boulevard to Highland Drive		$32 421	
	13	Prop 2	4 069	0 77	Carlsbad Village Drive from Olympia Drive to Victoria Avenue		$30 578	$62,999
D	14	Prop 2	6 984	1 32	Marron Road from Avenida de Anita to City of Oceanside		$7 518	$7,518
E	15	Prop 2	3 167	0 60	Paseo del Norte from Car Country Drive to Cannon Road		$23 781	
	16	Prop 2	4 927	0 93	Avenida Encinas from Poinsettia Lane to Cannon Road		$37,051	$60,832
F	17	Prop 2	3 677	0 70	Palomar Airport Road from Paseo del Norte to Carlsbad Boulevard		$27 694	
G	18	Prop 2	12 936	2 45	Rancho Santa Fe Road from Camino de los Coches to Melrose Drive		$97 097	
	19	Prop 2	3 612	0 68	Rancho Santa Fe Road from Olivenhain Road to City of Encinitas		$27 216	$124,313
H	20	Plan 2	21 336	4 04	Cannon Road from Paseo del Norte to City of Oceanside		$156 960	
	21	Plan 2	9 100	1 72	Faraday Avenue from current east end to City of Vista		$49 488	
	22	Plan 2	11 880	2 25	Poinsettia Lane from El Camino Real to Melrose Drive		$88 007	
	23	Plan 2	2 545	0 48	Melrose Avenue from Palomar Airport Road to City of Vista		$19 528	
	24	Plan 2	1 848	0 35	El Fuerte Street from current north end to Faraday Avenue		$14 400	
	25	Plan 2	7 465	1 41	Planned road from Rancho Santa Fe Road to City of Encinitas		$55 481	
	26	Plan 2	4 186	0 79	La Costa Ave from Rancho Santa Fe Road to planned road		$31 117	
	27	Plan 2	10 425	1 97	College Boulevard from El Camino Real to Tamarack Avenue		$77 820	$492,801
I	28	Paved 1	1 635	0 31	Connection between Carlsbad Blvd and Rail Trail along Agua Hedionda Lagoon		$29 647	$29,647
J	29	Paved 1	6 721	1 27	Agua Hedionda Creek drainage from El Camino Real to College Blvd	(2)	$442 960	
	30	Paved 1	8 279	1 57	Class 1 path along west end of Faraday Avenue alignment	(2)	$545 643	$545,643
K	31	Paved 1	4 480	0 85	Class 1 route from Faraday Avenue alignment to Palomar Airport Road	(2)	$295 263	
	32	Paved 1	12 857	2 44	Class 1 route paralleling Palomar Airport Rd from College Blvd to El Camino Real	(2)	$847 364	
	33	Paved 1	7 110	1 35	Class 1 route paralleling Poinsettia Lane from El Camino Real to El Fuerte St	(2)	$468 598	$1,611,225
L	34	Paved 1	4 870	0 92	Class 1 route from El Fuerte Street to Melrose Drive	(3)	$320 966	$320,966
M	35	Rail Trail	35 064	6 64	Class 1 route paralleling rail line from Oceanside to Encinitas	(4)	$3 091 230	$3,091,230
N	36	Multi Use	10 909	2 07	Lake Calaveras loop	(1)	$420 324	
	37	Multi Use	4 578	0 87	End of Carlsbad Village Drive at College Boulevard to Lake Calaveras loop		$301,722	$722,046
SS	SS1	Site-specific			Intersection of State Street and Carlsbad Boulevard	(5)		
	SS2	Site-specific			Intersection of Palomar Airport Road and Carlsbad Boulevard	(5)		
	SS3	Site specific			Intersection of Tamarack Avenue Pio Pico Drive and I 5	(6)		

Total: $7,111,555

***Legend:**

Paved 1 Proposed paved Class 1 paths
Unpaved 1 Proposed multi-use trail link
Prop 2 Proposed Class 2 lanes on existing roads
Plan 2 Class 2 lanes on planned roads
Prop 3 Class 3 routes on existing roads
Rail Trail Planned Class 1 trail in rail ROW

Notes:

(General) Bridges and major grading not included in costs (1) Route may lie partially within Oceanside
(2) Some parallel Class 2 routes may be built in place of these Class 1 routes
The final cost of construction would be determined by which types of routes are eventually built in each segment location
(3) Class 1 access to Leo Carrillo Ranch (4) Currently in design
(5) T intersection planned Improvements temporary
(6) May require structural work though restriping could be sufficient Lower priority

11 4 5 Public Art

Public art should be considered under any large-scale community project, including a bikeway master plan Art installations are most appropriate where the largest number of users can experience and appreciate them For this master plan, those locations would be along the Coastal Rail Trail, primarily at the transit centers and secondarily at the rest stops, assuming that a numerical criterion is used The coastal areas of the city are the most heavily used and the Coastal Rail Trail is expected to continue that trend Public art at the transit stations would also benefit a great many more users than those specifically using the Coastal Rail Trail Rail and bus users embarking and disembarking at the transit centers could also appreciate public art in such a highly visible venue (See Appendix B for specific city guidelines for public art in Carlsbad)

11 4 6 Transit Center Improvements

Transit center improvements directly contribute to the intermodal integration of the rail trail and the transit center The type of improvements that specifically benefit both facilities where they intersect are primarily bicycle storage facilities such as bike lockers and bike racks Other recommended transit center improvements are more general in nature and are intended to highlight the immediate area and direct users to the transit center (See Section 10 4 1, Special Urban Design Zones, for more information regarding these general improvements)

11 4 7 Summary

Due to the length and complexity of the bridges required to cross the lagoons and the additional construction necessary where available right-of-way width is limited, Class 1 bikeway costs will be significantly higher in these locations within the City of Carlsbad In almost all other respects, costs for the remainder of the Class 1 coastal facility should be similar to more typical installations, and may even be less due to the condition of the established rail roadbed and its moderate slopes

11 5 Bikeway Funding Sources

Federal, State and local government agencies invest billions of dollars every year in the nation's transportation system Only a fraction of that funding is used in development projects, policy development and planning to improve conditions for cyclists Even though appropriate funds are limited, they are available, but desirable projects sometimes go unfunded because communities may be unaware of a fund's existence, or may apply for the wrong type of grants Also, the competition between municipalities for the available bikeway funding is often fierce

Whenever Federal funds are used for bicycle projects, a certain level of State and/or local matching funding is generally required State funds are often available to local governments on the same terms Almost every implemented bicycle program and facility in the United States has had more than one funding source and it often takes a good deal of coordination and opportunism to pull the various sources together According to the FHWA's publication, An Analysis of Current Funding Mechanisms for Bicycle and Pedestrian Programs at the Federal, State and Local Levels, where successful local bike facility programs exist, there is usually a full-time bicycle coordinator with extensive understanding of funding sources Cities such as Seattle, Washington, Portland, Oregon and San Diego are prime examples Bicycle coordinators are often in a position to develop a competitive project and detailed proposal that can be used to improve conditions for cyclists within their jurisdictions Much of the following information on Federal and State funding sources was derived from the previously mentioned FHWA publication

11 5 1 Federal Sources

U S Department of Transportation

ISTEA (Intermodal Surface Transportation Efficiency Act) Enhancement Funds

In 1991, Congress re-authorized the collection and distribution of the Federal gasoline tax and related transportation spending programs The legislation was seen as particularly significant because the focus of 30 years of Federal transportation investment, the Interstate Highway System, was nearing completion The new legislation provided the opportunity to rethink transportation priorities and philosophies

ISTEA funding is managed through the State and regional agencies, in this case the San Diego Area Council of Governments (SANDAG) Most, but not all, of the funding programs are oriented toward transportation versus recreation, with the emphasis on reducing auto trips and providing intermodal connections Funding criteria include completion and adoption of a bicycle master plan, quantification of the costs and benefits of the system (including saved vehicle trips, reduced air pollution), proof of public involvement and support, CEQA compliance and the commitment of local resources In most cases, ISTEA provides matching grants of 80 to 90 percent The amount of money available through ISTEA is substantial (over $155 billion from 1992-97), but there is always strong competition to obtain those funds

ISTEA is currently undergoing re-authorization in Congress and was slated for final approval in late 1997 Current indicators are that ISTEA programs will continue, though under a new name, and states will be given more control over how funds are spent

Federal funding through the ISTEA program provides the bulk of outside funding ISTEA is comprised of two major programs, Surface Transportation Program (STP) and Congestion Management and Air Quality Improvement (CMAQ), along with other programs such as the National Recreational Trails Fund, Section 402 (Safety) funds, Scenic Byways funds and Federal Lands Highways funds, though municipalities are unlikely to be eligible for funding from all of these sources

Among the new concepts in the original legislation were intermodalism, transportation efficiency, funding flexibility and planning, all of which had direct benefits for cycling The legislation also created a wide range of funding opportunities for bicycle-related activities, including the following that may represent opportunities for the City of Carlsbad

• Surface Transportation Program (STP)

Section 1007 (a)(I)(b)(3) allows states to spend their allocation of Surface Transportation Program funds on a range of activities similar to those of the NHS Bicycle facilities are specifically listed as eligible items STP Funds can also be used for "nonconstruction bicycle projects related to safe bicycle use "

Section 1007 (b)(2)(C)(c) created a new category of transportation enhancement activities (TEA) on which States were required to spend at least 10 percent of their Surface Transportation Program funds TEAs are very broadly defined as

> ' with respect to any project or the area to be served by the project, provision of facilities for pedestrians and cyclists, acquisition of scenic easements and scenic or historic sites, scenic or historic highway programs landscaping and other scenic beautification, historic preservation rehabilitation and operation of historic transportation buildings, structures or facilities including historic rail road facilities and canals, preservation of abandoned railway corridors (including the conversion and use thereof for pedestrian and bicycle trails) control and removal of outdoor advertising archaeological planning and research and mitigation of water pollution due to highway runoff "

Surface Transportation Program funds are allocated to the California Department of Transportation (Caltrans), which makes the decisions as to how the funds are actually spent The Federal government does not allocate funds to specific projects Therefore, for a bicycle project to be funded, it must appear on the list of potential projects under consideration at the State, regional, or City level, whichever is appropriate

• Local Planning

Section 1024 (a) requires each metropolitan area (with a population greater than 200,000) to develop an annual or biannual Transportation Improvement Program (TIP) that "shall provide for the development of transportation facilities (including pedestrian walkways and bicycle transportation facilities) which will function as an intermodal transportation system " These TIPs must be based on available funding for projects in the program and they must be coordinated with transportation control measures to be implemented in accordance with Clean Air Act provisions Final project selection rests with the California Transportation Commission (CTC), with technical input from Caltrans

• State Planning

Two sections of the Act explicitly require the State to develop a TIP to "consider strategies for incorporating bicycle transportation facilities and pedestrian walkways in projects, throughout the State," (Section 1025 (c)(3)), and to "develop a long-range plan for bicycle transportation facilities and pedestrian walkways for appropriate areas of the State, which shall be incorporated into the long-range transportation plan,' (Section 1025 (e)) These provisions are important on a municipal level because they are crucial for getting incidental bicycle projects funded The intent behind these sections is to ensure that if bicycle facilities are identified in a TIP or long-range plan as being necessary in a corridor and construction or reconstruction work in those corridors is planned, then the relevant bicycle improvements called for in the planning must be included and implemented

Opportunities for incorporating bicycle projects are not limited to large transportation projects and not even to actual construction projects Independent bicycle and pedestrian projects, such as trails away from highway corridors and nonconstruction projects, such as mapping, also need to be incorporated into State and City planning documents if they are to be funded

Section 1033 states that the Federal share under ISTEA of bicycle transportation facilities is to be 80 percent The remaining 20 percent of the funds must be matched by the State or local government agency implementing the project The section also states that, to be funded, a bicycle transportation facility must be principally for transportation rather than recreation purposes This has been defined by the FHWA to mean

> Where Federal-aid highway funds are used, these projects should serve a transportation function A circular recreation path, for example, would not be eligible However, any type of facility which does serve a valid transportation need while also fulfilling recreation purposes would be eligible "

The section goes on to describe a "bicycle transportation facility" as

> "new or improved lanes, paths or shoulders for the use of cyclists, traffic control devices, shelters and parking fa cilities for cyclists "

• Congestion Mitigation and Air Quality Program (CMAQ)

Section 1008 is referred to as the Congestion Mitigation and Air Quality Program (CMAQ) This part of the legislation is intended to fund programs and projects likely to contribute to the attainment of national ambient air quality standards under the 1990 Clean Air Act Amendments Five areas of eligibility have been defined

Transportation activities in an approved State Implementation Plan (SIP) developed under the Clean Air Act

• Transportation Control Measures listed in Section 108 (b)(1)(A) of the Clean Air Act, which include

> "(ix) programs to limit portions of roadway surfaces or cer tain sections of the metropolitan area to the use of non motorized vehicles or pedestrian use, both as to time and place
>
> "(x) programs for secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of cyclists in both public and private areas, and
>
> "(xv) programs for new construction and major reconstruc tion of paths tracks, or areas solely for the use by pedes trians or other non-motorized means of transportation, when economically feasible and in the public interest "
>
> "Construction of bicycle and pedestrian facilities, nonconstruction projects related to safe bicycle use and State bicycle/pedestrian coordinator positions as established in the ISTEA for promoting and facilitating the in creased use of non motorized modes of transportation This includes public education, promotional and safety programs for using such facilities '

To be funded under this program, projects and programs must come from a transportation plan (or State (STIP) or Regional (RTIP) Transportation Improvement Program) that conforms with the SIP and must be consistent with the conformity provisions of Section 176 of the Clean Air Act

• Section 402 (Safety) Funds

Section 402 funds address State and community highway safety grant programs The priority status of safety programs for cyclists expedites the approval process for these safety efforts

Symms National Recreational Trails Act

The Symms National Recreational Trails Act created a trust fund for the construction and maintenance of trails At least 30 percent of the funds must be spent on trails for non-motorized users and at least 30 percent for trails for motorized users The remainder is to be allocated to projects as determined by the State Recreational Trails Advisory Board of the California Department of Parks and Recreation which the State must have to be eligible for the funds

Federal Transit Act

Section 25 of the 1964 Urban Mass Transportation Act states that

> "For the purposes of this Act a project to provide access for bicycles to mass transportation facilities, to provide shelters and parking facilities for bicycles in and around mass transportation facilities, or to install racks or other equipment for transporting bicycles on mass transportation vehicles shall be deemed to be a construction project eligible for assistance under sections 3, 9 and 18 of this Act "

The Federal share for such projects is 90 percent and the remaining 10 percent must come from sources other than Federal funds or fare-box revenues Typical funded projects have included bike lockers at transit stations and bike parking near major bus stops To date, no projects to provide bikeways for quicker, safer or easier access to transit stations have been requested or funded

Department of the Interior Land and Water Conservation Fund (LWCF)

This funding source is administered by the U S Recreation and Heritage Conservation Service and the State Department of Park and Recreation Any project for which LWCF funds are desired must meet two specific criteria The first is that projects acquired or developed under the program must be primarily for recreational use and not transportation purposes and the second is that the lead agency must guarantee to maintain the facility in perpetuity for public recreation

The application will be considered using criteria such as priority status within the State Comprehensive Outdoor Recreation Plan (SCORP) State Department of Park and Recreation will select which projects to submit to the National Park Service (NPS) for approval Final approval is based on the amount of funds available that year, which is determined by a population-based formula Trails are the most commonly approved project type A recent example is the restoration and expansion of trails within Florida Canyon in San Diego's Balboa Park

National Recreational Trail Fund

This funding source is intended to pay for a variety of recreational trails programs to benefit cyclists, pedestrians and other non-motorized users Projects must be consistent with the State Comprehensive Outdoor Recreation Plan required by the Land and Water Conservation Act

11 5 2 State Sources

Streets and Highways Code Bicycle Lane Account (BLA)

Section 2106 (b) of the Streets and Highways Code transfers funds annually to a Bicycle Lane Account (BLA) from the revenue derived from the excise tax on motor vehicle fuel The BLA is administered by the Caltrans Office of Bicycle Facilities which allocates funds to cities and counties It is locally administered through SANDAG to counties and cities Approximately $1 2 million is available annually to projects in San Diego County

For a project to be funded from the BLA, the project shall

i) Be approximately parallel to a State, county, or city roadways, where the separation of bicycle traffic from motor vehicle traffic will increase the traffic capacity of the road way, and
ii) Serve the functional needs of commuting cyclists, and
iii) Include but not be limited to

- New bikeways serving major transportation corridors,
- New bikeways removing travel barriers to potential bi cycle commuters
- Secure bicycle parking at employment centers, park and ride lots and transit terminals,
- Bicycle carrying facilities on public transit vehicles,
- Installation of traffic control devices to improve the safety and efficiency of bicycle travel,
- Elimination of hazardous conditions on existing bikeways serving a utility purpose
- Planning and
- Safety and education

Maintenance is specifically excluded from funding and allocation takes into consideration the relative cost effectiveness of the proposed project

State Highway Account

Section 157 4 of the Streets and Highways Code requires Caltrans to set aside $360,000 for the construction of non-motorized facilities that will be used in conjunction with the State highway system The State Highway Account fund is also administered by the Office of Bicycle Facilities

Funding is divided into different project categories Minor B projects (less than $42,000) are funded by a lump-sum allocation by the CTC and are used at the discretion of each Caltrans District office

Minor A projects (estimated to cost between $42,000 and $300,000) must be approved by the CTC Major projects (more than $300,000) must be included in the State Transportation Improvement Program and approved by the CTC Funded projects have included fencing and bicycle warning signs related to rail corridors

Transportation Development Act Article III (Senate Bill 821)

Transportation Development Act Article III funds are State block grants awarded annually to local jurisdictions for bicycle and pedestrian projects in California The funds originate from the State retail sales tax and are distributed through the Congestion Management Agency to local jurisdictions based generally of population Examples of expenditures have included construction of bicycle facilities and printing of bicycle safety posters on the back of city buses (Carlsbad is slated to receive $340,000 in TDA funds in FY1998)

11 5 3 Other Sources of Funding for Bicycle Projects

Governor's Energy Office (Oil Overcharge Funds)

The Federal government forced oil companies to repay the excess profits many of them made when they violated price regulations enacted in response to the energy crisis of the early 1970's Few states have taken advantage of this fund, but some have received grants for bike coordinators and bicycle facilities The types of projects eligible for funding vary by state, as does the level of allocation available

Coastal Conservancy Funds

Coastal communities are eligible to receive funds from the Coastal Conservancy from its Coastal Access Program Bicycle parking and bicycle access projects are eligible, but must be within the coastal zone as defined by the locally adopted Local Coastal Program (LCP) Generally, projects must meet the following criteria

- Serve a greater than local need,
- Address a critical public safety problem,
- Take advantage of a unique opportunity,
- Be part of a comprehensive regional access program,
- Demonstrate an innovative and cost effective design that meets the "Conservancy's Coastal Access Standards and Recommendations",
- Be completed within one year of grant approval, and
- Provide wheelchair access opportunities

11 5 4 Local Sources

TransNet Sales Tax funds

San Diego County voters passed a local tax ordinance authorizing the creation of the TransNet Sales Tax, imposing a 1/2 cent "transaction and use tax" solely to fund transportation improvements About one million dollars has been allocated for improved bicycle routes throughout the region The ordinance describes bicycle facilities and requirements for facilities as

"All purposes necessary and convenient to the design, right of-way acquisition and construction of facilities intended for the use of bicycles Bicycle facilities shall also mean facilities and programs that help to encourage the use of bicycles, such as secure bicycle parking facilities, bicycle promotion programs and bicycle safety education pro grams "

'All new highway projects funded with revenues as pro vided in this measure, which are also identified as bikeway facilities in the regional Transportation Plan, shall be re quired to include provision for bicycle use "

Proposition A

This is a funding source administered by SANDAG with an annual availability of approximately $1 million per year

Assembly Bill 2766 / 434

This bill funds air pollution reduction projects related to alternate modes of transportation This fund is administered by the Air Pollution Control Board (APCB) Approximately $3 million is available annually

Commuter Computer

This program is funded by Caltrans and covers a variety of transportation management activities including projects such as bicycle lockers and security devices These will be provided, installed and maintained for public agencies at no cost to the requesting agency Commuter Computer also offers a bicycle locker loan program to private sector entities

Developer Impact Fees

As a condition for development approval, it is possible to require the developer to provide certain infrastructure improvements, which can include bicycle projects These projects have commonly provided Class 2 facilities for portions of on-street, previously planned routes They can also be used to provide bicycle parking or shower and locker facilities The type of facility that should be required to be built by developers should reflect the greatest need for the particular project and its local area Legal challenges to these types of fees have resulted in the requirement to illustrate a clear nexus between the particular project and the mandated improvement and cost

New Construction

Future road widening and construction projects are one means of providing on-street bicycle facilities To ensure that roadway construction projects provide bike lanes where needed It is important that the review process includes input pertaining to consistency with the proposed system Future development in the City of Carlsbad will contribute only if the projects are conditioned

Restoration

Cable TV and telephone companies sometimes need new cable routes within public rights-of-way Recently, this has most commonly occurred during expansion of fiber optic networks Since these projects require a significant amount of advance planning and disruption of curb lanes, it may be possible to request reimbursement for affected bicycle facilities to mitigate construction impacts In cases where cable routes cross undeveloped areas, it may be possible to provide for new bikeway facilities following completion of the cable trenching, such as sharing the use of maintenance roads

Other Sources

Local sales taxes, fees and permits may be implemented as new funding sources for bicycle projects However, any of these potential sources would require a local election

Volunteer programs may be developed to substantially reduce the cost of implementing some routes, particularly multi-use paths For example, a local college design class may use such a multi-use route as a student project, working with a local landscape architectural or engineering firm Work parties could be formed to help clear the right-of-way for the route A local construction company may donate or discount services beyond what the volunteers can do A challenge grant program with local businesses may be a good source of local funding, in which the businesses can "adopt" a route and help to construct and maintain it

Most Likely Sources

According to City of Carlsbad sources, the most likely local sources of bikeway funding are the following

1) TDA/CIP (Transportation Development Act, Capital Improvement Projects)
2) TIF (Traffic Impact Fee Fund)
3) City of Carlsbad General Fund
4) Developer Impact Fees
5) BLA (Bicycle Lane Account)
6) APCB (Air Pollution Control Board)

Carlsbad Bikeway Master Plan — Capital Cost Estimate

Project A

Segment 1 Laguna Drive from Jefferson Street to State Street

This segment would be on a roadway with low motor vehicle traffic volume and would provide a connection between the northernmost east/west routes in the City of Carlsbad and the coastal north/south routes Its western end would be near both the existing Class 2 facility on Carlsbad Boulevard and the planned Class 1 Coastal Rail Trail This segment would also provide access to Maxton Brown Park on the south shore of Buena Vista Lagoon

Class 3 Length	3,150 Feet	0 60 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 3 Facility				
Bike Route Signs	EA	$165 00	6	**$990**
			Subtotal	**$990**

Additional Costs:	
Contingencies (20%)	**$198**
Construction Costs with Contingencies	**$1,188**
Engineering and Design (10%)	**$119**
Administration (5%)	**$59**
Construction Management (7%)	**$83**
Total Construction Costs:	**$1,449**

Project A

Segment 2 State Street from Grand Avenue to Carlsbad Boulevard

This segment parallels the rail line on a street with moderate motor vehicle traffic volumes It would provide access to the downtown transit center and connect it with routes to the north and south, including the planned Coastal Rail Trail and the existing Class 2 route on Carlsbad Boulevard This segment could also be considered an alternative route for the Coastal Rail Trail

Class 3 Length 2,484 Feet 0 47 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 3 Facility				
Bike Route Signs	EA	$165 00	6	**$990**
			Subtotal	**$990**

Additional Costs:	
Contingencies (20%)	**$198**
Construction Costs with Contingencies	**$1,188**
Engineering and Design (10%)	**$119**
Administration (5%)	**$59**
Construction Management (7%)	**$83**
Total Construction Costs:	**$1,449**

Carlsbad Bikeway Master Plan — Capital Cost Estimate

Project A

Segment 3 Las Flores Drive from Jefferson Street to Highland Drive

This segment connects the northeastern residential sections of Carlsbad immediately east of I-5 to the downtown business district west of I-5 using the existing Las Flores Drive bridge over I-5 The Las Flores Drive bike route then connects to an existing Class 2 route (Jefferson Street) running north/south

Class 3 Length	3,150	Feet	0 60 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 3 Facility				
Bike Route Signs	EA	$165 00	6	**$990**
			Subtotal	**$990**

Additional Costs:

Contingencies (20%)	**$198**
Construction Costs with Contingencies	**$1,188**
Engineering and Design (10%)	**$119**
Administration (5%)	**$59**
Construction Management (7%)	**$83**
Total Construction Costs:	**$1,449**

Project A

Segment 4 Highland Drive from Las Flores Drive to Chinquapin Avenue

This segment creates a north/south link east of I-5 from northern Carlsbad to just north of Agua Hedionda Lagoon Much of this proposed segment is currently listed as "undesignated" routes and would occur on relatively lightly traveled roadways through residential areas

Class 3 Length	6,643	Feet	1 26 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 3 Facility				
Bike Route Signs	EA	$165 00	14	**$2,310**
			Subtotal	**$2,310**

Additional Costs:	
Contingencies (20%)	**$462**
Construction Costs with Contingencies	**$2,772**
Engineering and Design (10%)	**$277**
Administration (5%)	**$139**
Construction Management (7%)	**$194**
Total Construction Costs:	**$3,382**

Carlsbad Bikeway Master Plan — Capital Cost Estimate

Project A

Segment 5 Chestnut Street from Carlsbad Boulevard to El Camino Real

This segment takes advantage of an existing crossing under I-5 that is not encumbered by a freeway intersection Chestnut Street does not have high motor vehicle traffic volumes and runs through primarily residential areas from north central Carlsbad at El Camino Real to Carlsbad Boulevard on the coast The only missing section is at the rail line right-of-way, but this is also one of the points at which a rail line crossing is proposed under this bikeway master plan

Class 3 Length 10,302 Feet 1 95 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 3 Facility				
Bike Route Signs	EA	$165 00	20	**$3,300**
			Subtotal	**$3,300**

Additional Costs:	
Contingencies (20%)	**$660**
Construction Costs with Contingencies	**$3,960**
Engineering and Design (10%)	**$396**
Administration (5%)	**$198**
Construction Management (7%)	**$277**
Total Construction Costs:	**$4,831**

Project A

Segment 6 Chinquapin Avenue from Coastal Rail Trail to Highland Drive

This proposed segment would take advantage of an existing crossing over I-5 that is not encumbered by a freeway intersection It would connect Segment 4 to the proposed Coastal Rail Trail and with Segment 7 along the north shore of Agua Hedionda Lagoon Chinquapin Avenue has relatively low motor vehicle traffic volumes and runs primarily through residential areas

Class 3 Length	3,690	Feet	0 70 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 3 Facility				
Bike Route Signs	EA	$165 00	8	**$1,320**
			Subtotal	**$1,320**

Additional Costs:	
Contingencies (20%)	**$264**
Construction Costs with Contingencies	**$1,584**
Engineering and Design (10%)	**$158**
Administration (5%)	**$79**
Construction Management (7%)	**$111**
Total Construction Costs:	**$1,932**

Carlsbad Bikeway Master Plan — Capital Cost Estimate

Project A

Segment 7 Adams Street from Chinquapin Avenue to Park Drive

This segment would provide part of a scenic connection from the residential areas of northwestern Carlsbad to central Carlsbad along the northern shore of Agua Hedionda Lagoon This proposed segment is currently considered an "undesignated" route Adams Street has relatively low motor vehicle traffic volumes

Class 3 Length	4,435 Feet	0 84 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 3 Facility				
Bike Route Signs	EA	$165 00	8	**$1,320**
			Subtotal	**$1,320**

Additional Costs:	
Contingencies (20%)	**$264**
Construction Costs with Contingencies	**$1,584**
Engineering and Design (10%)	**$158**
Administration (5%)	**$79**
Construction Management (7%)	**$111**
Total Construction Costs:	**$1,932**

Carlsbad Bikeway Master Plan — Capital Cost Estimate

Project A

Segment 8 Park Drive from Tamarack Avenue to Kelly Drive

This segment is a continuation of an existing Class 3 route adjacent to Carlsbad High School and other municipal facilities on Monroe Street, to Park Drive crossing Tamarack Drive It would connect this area of central Carlsbad to El Camino Real via the northern shore of Agua Hedionda Lagoon and then on an existing Class 2 route on Kelly Drive adjacent to an elementary school and park The proposed Segment 7 on Adams Street that intersects this segment would provide a link to the residential areas immediately east of I-5 and then to areas west of I-5 via Chinquapin Avenue (Segment 6)

Class 3 Length	9,163	Feet	1 74 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 3 Facility				
Bike Route Signs	EA	$165 00	18	**$2,970**
			Subtotal	**$2,970**

Additional Costs:	
Contingencies (20%)	**$594**
Construction Costs with Contingencies	**$3,564**
Engineering and Design (10%)	**$356**
Administration (5%)	**$178**
Construction Management (7%)	**$249**
Total Construction Costs:	**$4,348**

Project A

Segment 9 Gabbiano Lane from Batiquitos Drive to Batiquitos Lagoon

This segment would provide a link between the Class 2 and 3 on-street sections of the City of Carlsbad bikeway system and Batiquitos Lagoon This segment would run from Segment 10 (Class 3, Batiquitos Drive off Poinsettia Lane), to Batiquitos Lagoon

Class 3 Length	1,718	Feet	0 33 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 3 Facility				
Bike Route Signs	EA	$165 00	4	**$660**
			Subtotal	**$660**

Additional Costs:	
Contingencies (25%)	**$132**
Construction Costs with Contingencies	**$792**
Engineering and Design (10%)	**$79**
Administration (5%)	**$40**
Construction Management (7%)	**$55**
Total Construction Costs:	**$966**

Project B

Segment 10 Batiquitos Drive from Gabbiano Lane to Poinsettia Lane

This segment would provide part of an alternative east/west route paralleling Aviara Parkway that would avoid much of its steepest grades, its higher motor vehicle traffic speeds and volumes It would provide a more relaxed and scenic route since much of it runs parallel to Batiquitos Lagoon

Class 3 Length 2,500 Feet 0 47 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 3 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 47	**$1,563**
No Parking Signs	EA	$165 00	5	**$825**
Stripe Removal	LF	$2 20	2,500	**$5,500**
Restripe Centerline w/Reflectors	LF	$2 20	2,500	**$0**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	8	**$440**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$8,328**

Additional Costs:	
Contingencies (20%)	**$1,666**
Construction Costs with Contingencies	**$9,993**
Engineering and Design (10%)	**$999**
Administration (5%)	**$500**
Construction Management (7%)	**$700**
Total Construction Costs:	**$12,191**

Project B

Segment 11 Camino de los Ondas from Hidden Valley Rd to Paseo del Norte

This segment would close a gap between two existing Class 2 facilities and connect Palomar Airport Road with Paseo del Norte It would allow riders to avoid a very busy intersection by creating an alternative route that runs through a relatively lightly traveled residential area

Class 2 Length	1,030 Feet	0 20 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 20	**$660**
No Parking Signs	EA	$165 00	2	**$330**
Stripe Removal	LF	$2 20	1,030	**$2,266**
Restripe Centerline w/Reflectors	LF	$2 20	1,030	**$2,266**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	4	**$220**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$5,742**

Additional Costs:	
Contingencies (20%)	**$1,148**
Construction Costs with Contingencies	**$6,890**
Engineering and Design (10%)	**$689**
Administration (5%)	**$345**
Construction Management (7%)	**$482**
Total Construction Costs:	**$8,406**

Project C

Segment 12 Carlsbad Village Drive from Carlsbad Boulevard to Highland Drive

This segment represents a continuation of the existing Class 2 lanes on Carlsbad Village Drive east of I-5 through to downtown, Carlsbad Boulevard and the coast This route would provide access to the downtown transit station and the proposed Coastal Rail Trail from residential areas east of I-5 It would require restriping and possibly reconfiguration of substantial portions of Carlsbad Village Drive due to the minimal roadway width currently available through much of this proposed segment

Class 2 Length	4,082 Feet	0 77 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 77	**$2,551**
No Parking Signs	EA	$165 00	3	**$510**
Stripe Removal	LF	$2 20	4,082	**$8,980**
Restripe Centerline w/Reflectors	LF	$2 20	4,082	**$8,980**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	8	**$440**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$21,462**

Additional Costs:

Contingencies (20%)	**$4,292**
Construction Costs with Contingencies	**$25,755**
Engineering and Design (10%)	**$2,575**
Administration (5%)	**$1,288**
Construction Management (7%)	**$1,803**
Total Construction Costs:	**$31,421**

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Project C

Segment 13 Carlsbad Village Drive from Olympia Drive to Victoria Avenue

This proposed segment would constitute the completion (along with Segments 12 and 14) of Class 2 lanes on Carlsbad Village Drive along a section where no facilities currently exist This would create a direct Class 2 route from coastal Carlsbad to the City of Oceanside once College Boulevard is completed

Class 2 Length	4,069 Feet	0 77 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 77	**$2,543**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	4,069	**$8,952**
Restripe Centerline w/Reflectors	LF	$2 20	4,069	**$8,952**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	8	**$440**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$20,887**

Additional Costs:	
Contingencies (25%)	**$4,177**
Construction Costs with Contingencies	**$25,064**
Engineering and Design (10%)	**$2,506**
Administration (5%)	**$1,253**
Construction Management (7%)	**$1,754**
Total Construction Costs:	**$30,578**

Project D

Segment 14 Marron Road from Avenida de Anita to City of Oceanside

This segment would be a continuation of the Class 2 lanes currently existing on Marron Road once its construction proceeds eastward to the City of Oceanside There is little bicycle traffic on Marron Road east of El Camino Real at present because it currently stops not far east of El Camino Real This should change upon completion into Oceanside because this segment will provide a east/west route paralleling SR78 to the coast as well as accessing a regional shopping center and transit center

Class 2 Length	6,984 Feet	1 32 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	1 32	**$4,365**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	0	**$0**
Restripe Centerline w/Reflectors	LF	$2 20	0	**$0**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	14	**$770**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$5,135**

Additional Costs:	
Contingencies (25%)	**$1,027**
Construction Costs with Contingencies	**$6,162**
Engineering and Design (10%)	**$616**
Administration (5%)	**$308**
Construction Management (7%)	**$431**
Total Construction Costs:	**$7,518**

Project E

Segment 15 Paseo del Norte from Car Country Drive to Cannon Road

This segment would constitute the completion of Class 2 lanes on Paseo del Norte Class 2 lanes currently exist along the remainder of this street This would create a direct Class 2 route from Poinsettia Lane to Cannon Road and provide access to areas west of I-5 via three freeway crossing points within the middle third of the City of Carlsbad This proposed segment would also provide access to several eastward routes that would in turn access employment centers within central Carlsbad

Class 2 Length	3,167 Feet	0 60 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 60	**$1,979**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	3,167	**$6,967**
Restripe Centerline w/Reflectors	LF	$2 20	3,167	**$6,967**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	6	**$330**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$16,244**

Additional Costs:	
Contingencies (20%)	**$3,249**
Construction Costs with Contingencies	**$19,493**
Engineering and Design (10%)	**$1,949**
Administration (5%)	**$975**
Construction Management (7%)	**$1,365**
Total Construction Costs:	**$23,781**

Project E

Segment 16 Avenida Encinas from Poinsettia Lane to Cannon Road

This proposed segment would provide direct Class 2 route access to the Poinsettia Station transit center between Poinsettia Lane and Palomar Airport Road from as far north as Cannon Road

It would also provide access to the planned Coastal Rail Trail at a point just south of Poinsettia Road where Avenida Encinas swings west and intersects Carlsbad Boulevard and the Coastal Rail Trail

Class 2 Length	4,927 Feet	0 93 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 93	**$3,079**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	4,927	**$10,839**
Restripe Centerline w/Reflectors	LF	$2 20	4,927	**$10,839**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	10	**$550**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$25,308**

Additional Costs:

Contingencies (20%)	**$5,062**
Construction Costs with Contingencies	**$30,370**
Engineering and Design (10%)	**$3,037**
Administration (5%)	**$1,518**
Construction Management (7%)	**$2,126**
Total Construction Costs:	**$37,051**

Project F

Segment 17 Palomar Airport Road from Paseo del Norte to Carlsbad Blvd

This proposed segment would constitute the completion of Class 2 lanes on Palomar Airport Road along a section where no facilities currently exist This segment would intersect Carlsbad Boulevard, creating a direct Class 2 route between coastal Carlsbad to the City of San Marcos This segment has a major problem in the limited width currently available on the bridge over the rail line However, any improvements in the short term are to be considered temporary since this problematic intersection is slated to be replaced with a "T" configuration

Class 2 Length	3,677 Feet	0 70 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 70	**$2,298**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	3,677	**$8,089**
Restripe Centerline w/Reflectors	LF	$2 20	3,677	**$8,089**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	8	**$440**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$18,917**

Additional Costs:	
Contingencies (20%)	**$3,783**
Construction Costs with Contingencies	**$22,700**
Engineering and Design (10%)	**$2,270**
Administration (5%)	**$1,135**
Construction Management (7%)	**$1,589**
Total Construction Costs:	**$27,694**

Project G

Segment 18 Rancho Santa Fe Rd from Camino de los Coches to Melrose Dr

Only a short section of Rancho Santa Fe Road currently has Class 2 lanes in place This proposed segment would constitute the completion (along with Segment 19) of Class 2 lanes on the entire length of Rancho Santa Fe Road in the sections where no facilities currently exist within the City of Carlsbad Much of the improvements can be accomplished within the existing right-of-way, but the southern portion of this segment between Denning Drive and La Costa Avenue may need to be widened to accommodate a Class 2 facility

Class 2 Length	12,936 Feet	2 45 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	2 45	**$8,085**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	12,936	**$28,459**
Restripe Centerline w/Reflectors	LF	$2 20	12,936	**$28,459**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	24	**$1,320**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$66,323**

Additional Costs:	
Contingencies (20%)	**$13,265**
Construction Costs with Contingencies	**$79,588**
Engineering and Design (10%)	**$7,959**
Administration (5%)	**$3,979**
Construction Management (7%)	**$5,571**
Total Construction Costs:	**$97,097**

Carlsbad Bikeway Master Plan — Capital Cost Estimate

Project G

Segment 19 Rancho Santa Fe Road from Olivenhain Road to City of Encinitas

Only a short section of Rancho Santa Fe Road currently has Class 2 lanes in place This proposed segment would constitute the completion (along with Segment 18) of Class 2 lanes on the entire length of Rancho Santa Fe Road in the sections where no facilities currently exist within the City of Carlsbad Some of the improvements may be accomplished with restriping, but this segment will need to be widened to accommodate a Class 2 facility It would create a link between the northeastern section of the City of Encinitas and coastal Carlsbad via Olivenhain Road or La Costa Avenue

Class 2 Length	3,612 Feet	0 68 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 68	**$2,258**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	3,612	**$7,946**
Restripe Centerline w/Reflectors	LF	$2 20	3,612	**$7,946**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	8	**$440**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
Roadway Widening	LF			
			Subtotal	**$18,590**

Additional Costs:	
Contingencies (25%)	**$3,718**
Construction Costs with Contingencies	**$22,308**
Engineering and Design (10%)	**$2,231**
Administration (5%)	**$1,115**
Construction Management (7%)	**$1,562**
Total Construction Costs:	**$27,216**

Project H

Segment 20 Cannon Road from Paseo del Norte to City of Oceanside

This long segment represents a planned eastward extension of Cannon Road to include Class 2 lanes This proposed segment would create a direct Class 2 route between the City of Oceanside and coastal Carlsbad Several other proposed north/south segments would intersect this segment, making it a regional connection

Class 2 Length	21,336 Feet	4 04 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	4 04	**$13,335**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	21,336	**$46,939**
Restripe Centerline w/Reflectors	LF	$2 20	21,336	**$46,939**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	0	**$0**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$107,213**

Additional Costs:	
Contingencies (20%)	**$21,443**
Construction Costs with Contingencies	**$128,656**
Engineering and Design (10%)	**$12,866**
Administration (5%)	**$6,433**
Construction Management (7%)	**$9,006**
Total Construction Costs:	**$156,960**

Carlsbad Bikeway Master Plan — Capital Cost Estimate

Project H

Segment 21 Faraday Avenue from current east end to City of Vista

This segment represents a planned eastward extension of Faraday Avenue to include Class 2 lanes into the City of Vista This proposed segment would complete a Class 2 route connecting Vista and coastal Carlsbad via Faraday Avenue and Cannon Road

Class 2 Length	6,280 Feet	1 72 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	1 72	**$5,676**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	6,280	**$13,816**
Restripe Centerline w/Reflectors	LF	$2 20	6,280	**$13,816**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	9	**$495**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$33,803**

Additional Costs:	
Contingencies (20%)	**$6,761**
Construction Costs with Contingencies	**$40,564**
Engineering and Design (10%)	**$4,056**
Administration (5%)	**$2,028**
Construction Management (7%)	**$2,839**
Total Construction Costs:	**$49,488**

Project H

Segment 22 Poinsettia Lane from El Camino Real to Melrose Drive

This proposed segment represents the planned extension of Poinsettia Lane to include Class 2 lanes from where Poinsettia Lane currently ends just east of El Camino Real to Melrose Drive Besides connecting coastal Carlsbad with the Cities of Vista and San Marcos via Melrose Drive, other existing and planned north/south segments also intersect this segment within Carlsbad, making it a regional bikeway link

Class 2 Length	11,880 Feet	2 25 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	2 25	**$7,425**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	11,880	**$26,136**
Restripe Centerline w/Reflectors	LF	$2 20	11,880	**$26,136**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	20	**$1,100**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$60,797**

Additional Costs:	
Contingencies (25%)	**$12,159**
Construction Costs with Contingencies	**$72,956**
Engineering and Design (10%)	**$7,296**
Administration (5%)	**$3,648**
Construction Management (7%)	**$5,107**
Total Construction Costs:	**$89,007**

Project H

Segment 23 Melrose Drive from Palomar Airport Road to City of Vista

This segment represents a planned northward extension of Melrose Avenue from Palomar Airport Road into the City of Vista to include Class 2 lanes This proposed segment would create a contiguous Class 2 route connecting the Cities of Encinitas, San Marcos and Vista via Melrose Drive and Rancho Santa Fe Road

Class 2 Length	2,545 Feet	0 48 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 48	**$1,591**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	2,545	**$5,599**
Restripe Centerline w/Reflectors	LF	$2 20	2,545	**$5,599**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	10	**$550**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$13,339**

Additional Costs:	
Contingencies (25%)	**$2,668**
Construction Costs with Contingencies	**$16,006**
Engineering and Design (10%)	**$1,601**
Administration (5%)	**$800**
Construction Management (7%)	**$1,120**
Total Construction Costs:	**$19,528**

Project H

Segment 24 El Fuerte Street from current north end to Faraday Avenue

This segment represents a planned northward extension of El Fuerte Street from Alga Road to Faraday Avenue to include Class 2 lanes This proposed segment would create a Class 2 route connecting east central and south central Carlsbad, and intersect three other existing and proposed east/west routes

Class 2 Length	1,848 Feet	0 35 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 35	**$1,155**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	1,848	**$4,066**
Restripe Centerline w/Reflectors	LF	$2 20	1,848	**$4,066**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	10	**$550**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$9,836**

Additional Costs:	
Contingencies (20%)	**$1,967**
Construction Costs with Contingencies	**$11,803**
Engineering and Design (10%)	**$1,180**
Administration (5%)	**$590**
Construction Management (7%)	**$826**
Total Construction Costs:	**$14,400**

Carlsbad Bikeway Master Plan — Capital Cost Estimate

Project H

Segment 25 Planned road from Rancho Santa Fe Rd to City of Encinitas

This segment represents a planned northward extension of a roadway from the City of Encinitas into the City of Carlsbad that would include Class 2 lanes This proposed segment would create a Class 2 route connecting northern Encinitas with western San Marcos and Vista via eastern Carlsbad using contiguous sections of the planned road, Rancho Santa Fe Road and Melrose Avenue

Class 2 Length	7,465 Feet	1 41 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	1 41	**$4,666**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	7,465	**$16,423**
Restripe Centerline w/Reflectors	LF	$2 20	7,465	**$16,423**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	7	**$385**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$37,897**

Additional Costs:	
Contingencies (20%)	**$7,579**
Construction Costs with Contingencies	**$45,476**
Engineering and Design (10%)	**$4,548**
Administration (5%)	**$2,274**
Construction Management (7%)	**$3,183**
Total Construction Costs:	**$55,481**

Carlsbad Bikeway Master Plan — Capital Cost Estimate

Project H

Segment 26 La Costa Ave from Rancho Santa Fe Rd to planned road

This segment represents a planned eastward extension of La Costa Avenue to Camino de los Coches that would include Class 2 lanes This would eventually provide a Class 2 connection from the northeastern section of the City of Encinitas through southern Carlsbad to the coast via La Costa Avenue

Class 2 Length	4,186 Feet	0 79 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	0 79	**$2,616**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	4,186	**$9,209**
Restripe Centerline w/Reflectors	LF	$2 20	4,186	**$9,209**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	4	**$220**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$21,255**

Additional Costs:

Contingencies (25%)	**$4,251**
Construction Costs with Contingencies	**$25,506**
Engineering and Design (10%)	**$2,551**
Administration (5%)	**$1,275**
Construction Management (7%)	**$1,785**
Total Construction Costs:	**$31,117**

Project H

Segment 27 College Boulevard from El Camino Real to Tamarack Avenue

This segment represents the planned northward extension of College Boulevard from El Camino Real into the City of Oceanside to include Class 2 lanes This proposed segment would complete a Class 2 route along the entire length of College Boulevard within the City of Carlsbad It would provide a northeast to southwest central artery through Carlsbad into Oceanside, intersecting several other planned east/west segments

Class 2 Length	10,425 Feet	1 97 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 2 Facility				
Bike Lane Striping/Signing	MI	$3,300 00	1 97	**$6,516**
No Parking Signs	EA	$165 00	0	**$0**
Stripe Removal	LF	$2 20	10,425	**$22,935**
Restripe Centerline w/Reflectors	LF	$2 20	10,425	**$22,935**
Restripe Continuous Left Turn	LF	$3 30	0	**$0**
Pavement Markings	EA	$55 00	14	**$770**
Bike Detector Loops	EA	$385 00	0	**$0**
Through Loops	EA	$825 00	0	**$0**
			Subtotal	**$53,156**

Additional Costs:	
Contingencies (20%)	**$10,631**
Construction Costs with Contingencies	**$63,787**
Engineering and Design (10%)	**$6,379**
Administration (5%)	**$3,189**
Construction Management (7%)	**$4,465**
Total Construction Costs:	**$77,820**

Project I

Segment 28 Agua Hedionda connection

This segment would connect the proposed Coastal Rail Trail alignment with the existing Carlsbad Boulevard Class 2 facility Much of this route is existing as asphalt roadway

Class 1 Length	1,635 Feet	0 31 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 1 Facility				
Bike Path Striping/Signing	MI	$3,300 00	0 31	**$1,023**
96" AC Path w/Agg Base (3"/6")	SF	$1 22	13,080	**$15,958**
2-24" Parallel DG Paving Paths (3")	SF	$0 50	6,540	**$3,270**
Clear and Grub	SF	$0 55	0	**$0**
Subgrade Prep/Exec	CY	$16 50	0	**$0**
Drainage	LF	$5 50	0	**$0**
Fencing	LF	$13 20	0	**$0**
			Subtotal	**$20,251**

Additional Costs:	
Contingencies (20%)	**$4,050**
Construction Costs with Contingencies	**$24,301**
Engineering and Design (10%)	**$2,430**
Administration (5%)	**$1,215**
Construction Management (7%)	**$1,701**
Total Construction Costs:	**$29,647**

Project J

Segment 29 Agua Hedionda Creek from El Camino Real to College Blvd

This segment runs along the south side of the Agua Hedionda Creek drainage in a generally northeast to southwest direction as a scenic Class 1 route

Class 1 Length	6,721 Feet	1 27 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 1 Facility				
Bike Path Striping/Signing	MI	$3,300 00	1 27	**$4,201**
96" AC Path w/Agg Base (3"/6")	SF	$1 22	53,768	**$65,597**
2-24" Parallel DG Paving Paths (3")	SF	$0 50	26,884	**$13,442**
Clear and Grub	SF	$0 55	80,652	**$44,359**
Subgrade Prep/Exec	CY	$16 50	2,987	**$49,287**
Drainage	LF	$5 50	6,721	**$36,966**
Fencing	LF	$13 20	6,721	**$88,717**
			Subtotal	**$302,568**

Additional Costs:	
Contingencies (20%)	**$60,514**
Construction Costs with Contingencies	**$363,082**
Engineering and Design (10%)	**$36,308**
Administration (5%)	**$18,154**
Construction Management (7%)	**$25,416**
Total Construction Costs:	**$442,960**

Project J

Segment 30 Class 1 path along west end of Faraday Ave alignment

This segment would be one of five (30, 31, 32, 33 and 34) running in a generally northwest to southeast direction across central Carlsbad These segments would provide a scenic Class 1 access route from west central Carlsbad to the City of San Marcos

This particular segment would be the northern terminus for this series of Class 1 segments at Cannon Road and proceed parallel with the alignment of Faraday Avenue (Specific alignment would be determined pending a future route location study, possibly including the City of Carlsbad Municipal Golf Course)

Class 1 Length	8,279 Feet	1 57 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 1 Facility				
Bike Path Striping/Signing	MI	$3,300 00	1 57	**$5,174**
96" AC Path w/Agg Base (3"/6")	SF	$1 22	66,232	**$80,803**
2-24" Parallel DG Paving Paths (3")	SF	$0 50	33,116	**$16,558**
Clear and Grub	SF	$0 55	99,348	**$54,641**
Subgrade Prep/Exec	CY	$16 50	3,680	**$60,713**
Drainage	LF	$5 50	8,279	**$45,535**
Fencing	LF	$13 20	8,279	**$109,283**
			Subtotal	**$372,707**

Additional Costs:	
Contingencies (20%)	**$74,541**
Construction Costs with Contingencies	**$447,248**
Engineering and Design (10%)	**$44,725**
Administration (5%)	**$22,362**
Construction Management (7%)	**$31,307**
Total Construction Costs:	**$545,643**

Project K

Segment 31 Class 1 path from Faraday Ave to Palomar Airport Rd

This segment would be one of five (30, 31, 32, 33 and 34) running in a generally northwest to southeast direction across central Carlsbad These segments would provide a scenic Class 1 access route from west central Carlsbad to the City of San Marcos

This particular segment would be a Class 1 access route connecting Faraday Avenue with the remainder of this series of segments running roughly parallel and south of Palomar Airport Road This Class 1 system would provide an alternative to cycling on major roadways with high motor vehicle volumes and relatively high speeds (Specific alignment would be determined pending a future route location study)

Class 1 Length	4,480 Feet	0 85 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 1 Facility				
Bike Path Striping/Signing	MI	$3,300 00	0 85	**$2,800**
96" AC Path w/Agg Base (3"/6")	SF	$1 22	35,840	**$43,725**
2-24" Parallel DG Paving Paths (3")	SF	$0 50	17,920	**$8,960**
Clear and Grub	SF	$0 55	53,760	**$29,568**
Subgrade Prep/Exec	CY	$16 50	1,991	**$32,853**
Drainage	LF	$5 50	4,480	**$24,640**
Fencing	LF	$13 20	4,480	**$59,136**
			Subtotal	**$201,682**

Additional Costs:	
Contingencies (20%)	**$40,336**
Construction Costs with Contingencies	**$242,019**
Engineering and Design (10%)	**$24,202**
Administration (5%)	**$12,101**
Construction Management (7%)	**$16,941**
Total Construction Costs:	**$295,263**

Project K

Segment 32 Class 1 path parallelıng Palomar Aırport Road to El Camıno Real

Thıs segment would be one of fıve (30, 31, 32, 33 and 34) runnıng ın a generally northwest to southeast dırectıon across central Carlsbad These segments would provıde a scenıc Class 1 access route from west central Carlsbad to the Cıty of San Marcos

Thıs partıcular segment would be the Class 1 connectıon between College Boulevard and El Camıno Real (Specıfıc alıgnment would be determıned pendıng a future route locatıon study)

Class 1 Length	12,857 Feet	2 44 Mıles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 1 Facılıty				
Bıke Path Strıpıng/Sıgnıng	MI	$3,300 00	2 44	**$8,036**
96" AC Path w/Agg Base (3"/6")	SF	$1 22	102,856	**$125,484**
2-24" Parallel DG Pavıng Paths (3")	SF	$0 50	51,428	**$25,714**
Clear and Grub	SF	$0 55	154,284	**$84,856**
Subgrade Prep/Exec	CY	$16 50	5,714	**$94,285**
Draınage	LF	$5 50	12,857	**$70,714**
Fencıng	LF	$13 20	12,857	**$169,712**
			Subtotal	**$578,801**

Additional Costs:	
Contıngencıes (20%)	**$115,760**
Constructıon Costs wıth Contıngencıes	**$694,561**
Engıneerıng and Desıgn (10%)	**$69,456**
Admınıstratıon (5%)	**$34,728**
Constructıon Management (7%)	**$48,619**
Total Construction Costs:	**$847,364**

Project K

Segment 33 Class 1 along Poinsettia Lane from El Camino Real to El Fuerte St

This segment would be one of five (30, 31, 32, 33 and 34) running in a generally northwest to southeast direction across central Carlsbad These segments would provide a scenic Class 1 access route from west central Carlsbad to the City of San Marcos

This particular segment would be the Class 1 connection between El Camino Real and El Fuerte Street (Specific alignment would be determined pending a future route location study)

Class 1 Length	7,110 Feet	1 35 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 1 Facility				
Bike Path Striping/Signing	MI	$3,300 00	1 35	**$4,444**
96" AC Path w/Agg Base (3"/6")	SF	$1 22	56,880	**$69,394**
2-24" Parallel DG Paving Paths (3")	SF	$0 50	28,440	**$14,220**
Clear and Grub	SF	$0 55	85,320	**$46,926**
Subgrade Prep/Exec	CY	$16 50	3,160	**$52,140**
Drainage	LF	$5 50	7,110	**$39,105**
Fencing	LF	$13 20	7,110	**$93,852**
			Subtotal	**$320,080**

Additional Costs:	
Contingencies (20%)	**$64,016**
Construction Costs with Contingencies	**$384,096**
Engineering and Design (10%)	**$38,410**
Administration (5%)	**$19,205**
Construction Management (7%)	**$26,887**
Total Construction Costs:	**$468,598**

Project L

Segment 34 Class 1 route from El Fuerte Street to Melrose Drive

This segment would be one of five (30, 31, 32, 33 and 34) running in a generally northwest to southeast direction across central Carlsbad These segments would provide a scenic Class 1 access route from west central Carlsbad to the City of San Marcos

This particular segment would be the Class 1 connection between El Camino Real and Melrose Avenue and the eastern terminus for this series of Class 1 segments It would also provide Class 1 access to Carrillo Ranch (Specific alignment would be determined pending a future route location study)

Class 1 Length	4,870 Feet	0 92 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 1 Facility				
Bike Path Striping/Signing	MI	$3,300 00	0 92	**$3,044**
96" AC Path w/Agg Base (3"/6")	SF	$1 22	38,960	**$47,531**
2-24" Parallel DG Paving Paths (3")	SF	$0 50	19,480	**$9,740**
Clear and Grub	SF	$0 55	58,440	**$32,142**
Subgrade Prep/Exec	CY	$16 50	2,164	**$35,713**
Drainage	LF	$5 50	4,870	**$26,785**
Fencing	LF	$13 20	4,870	**$64,284**
			Subtotal	**$219,239**

Additional Costs:	
Contingencies (20%)	**$43,848**
Construction Costs with Contingencies	**$263,087**
Engineering and Design (10%)	**$26,309**
Administration (5%)	**$13,154**
Construction Management (7%)	**$18,416**
Total Construction Costs:	**$320,966**

Project M

Segment 35 Coastal Rail Trail

When completed, the planned Coastal Rail Trail would be the single longest segment proposed within this bikeway master plan It would run within the rail right-of-way along the east side of the rail line from the City of Oceanside to the City of Encinitas It would be part of the long-range Class 1 route from Oceanside to downtown San Diego

Constructing this segment would require crossing three lagoons, but for the foreseeable future, portions of this Class 1 facility would probably occur on surface streets as a Class 2 or 3 facility to temporarily circumvent the lagoons This cost analysis reflects the estimated completed cost

Note Does not include bridges over lagoons

Class 1 Length 35,064 Feet 6 64 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 1 Facility				
Bike Path Striping/Signing	MI	$3,300 00	6 64	**$21,915**
AC Paving w/Agg Base (3" on 6")	SF	$1 22	280,512	**$342,225**
24" Parallel DG Paving Path (3")	SF	$0 50	280,512	**$140,256**
Clear and Grub	SF	$0 55	420,768	**$231,422**
Subgrade Prep/Exec	CY	$16 50	15,584	**$257,136**
Drainage	LF	$5 50	35,064	**$192,852**
Fencing	LF	$13 20	70,128	**$925,690**
			Subtotal	**$2,111,496**

Additional Costs:	
Contingencies (20%)	**$422,299**
Construction Costs with Contingencies	**$2,533,795**
Engineering and Design (10%)	**$253,379**
Administration (5%)	**$126,690**
Construction Management (7%)	**$177,366**
Total Construction Costs:	**$3,091,230**

Project N

Segment 36 Lake Calaveras loop

This segment would be a recreationally oriented loop around Calaveras Lake It would take advantage of the numerous existing trails around the lake to define a alignment connected to the remainder of the City of Carlsbad's bikeway system Connection with bikeways within the City of Oceanside from this segment should also be feasible

Note Because trail surfacing is to be determined prior to implementation, the cost analysis assumes Class 1 type paving

Class 1 Length	10,909 Feet	2 07 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 1 Facility				
Bike Path Striping/Signing	MI	$3,300 00	2 07	**$6,818**
96" AC Path w/Agg Base (3"/6")	SF	$1 22	87,272	**$106,472**
2-24" Parallel DG Paving Paths (3")	SF	$0 50	43,636	**$21,818**
Clear and Grub	SF	$0 55	130,908	**$71,999**
Subgrade Prep/Exec	CY	$16 50	4,848	**$79,999**
Drainage	LF	$5 50	0	**$0**
Fencing	LF	$13 20	0	**$0**
			Subtotal	**$287,107**

Additional Costs:	
Contingencies (20%)	**$57,421**
Construction Costs with Contingencies	**$344,528**
Engineering and Design (10%)	**$34,453**
Administration (5%)	**$17,226**
Construction Management (7%)	**$24,117**
Total Construction Costs:	**$420,324**

Project N

Segment 37 End of Carlsbad Village Dr at College Bvld to Lake Calaveras loop

This segment would be the primary connection between the City of Carlsbad's Class 2 route system and the loop (Segment 36) proposed around Lake Calaveras, as well as the northern terminus of a proposed Class 1 system along the Agua Hedionda Creek drainage

Note Trail surfacing is to be determined prior to implementation, but the cost analysis assumes Class 1 type paving

Class 1 Length	4,578 Feet	0 87 Miles

Primary Costs	Unit	Unit Cost	Quantity	Total Cost
Class 1 Facility				
Bike Path Striping/Signing	MI	$3,300 00	0 87	**$2,861**
96" AC Path w/Agg Base (3"/6")	SF	$1 22	36,624	**$44,681**
2-24" Parallel DG Paving Paths (3")	SF	$0 50	18,312	**$9,156**
Clear and Grub	SF	$0 55	54,936	**$30,215**
Subgrade Prep/Exec	CY	$16 50	2,035	**$33,572**
Drainage	LF	$5 50	4,578	**$25,179**
Fencing	LF	$13 20	4,578	**$60,430**
			Subtotal	**$206,094**

Additional Costs:	
Contingencies (20%)	**$41,219**
Construction Costs with Contingencies	**$247,313**
Engineering and Design (10%)	**$24,731**
Administration (5%)	**$12,366**
Construction Management (7%)	**$17,312**
Total Construction Costs:	**$301,722**

12 - FACILITY GUIDELINES

These facility guidelines are intended to guide development of all types of bikeway facilities The first section considers the necessary planning aspects of bikeway system design in general The following section discusses general physical design guidelines Subsequent sections provide physical design information for specific classes of bikeway facilities

12 1 Bikeway Planning

Successfully implementing a bikeway system involves careful planning that considers a number of issues, including setting up appropriate mechanisms to take advantage of bikeway opportunities as they become available Author and bicycle planning expert Susan Pinsof has perhaps described the process most succinctly

"A comprehensive, affordable approach to bicycle planning involves maximizing the usefulness of existing infrastructure by improving the safety of shared roadway space, using opportunities, such as available open space corridors for trails, creating more "bicycle-friendly" communities through planning, design and regulation, and addressing the need for bicycle safety education and encouragement "

12 1 1 Local Emphasis

Cycling is primarily a local activity since most trips do not exceed five miles Experienced cyclists routinely ride further than this and their cross-community travel should be accommodated However, if it is a community goal to make localized cycling a viable option for personal transportation, then cyclist mobility must be improved and enhanced throughout the community, especially to important local destinations Even though State or Federal policies may influence or even dictate some design and implementation decisions, it is local decisions that will most significantly affect the potential for cycling within a community

12 1 2 Master Plan Process

The basis for a bicycle-friendly community can be established by instituting appropriate policies through the development and adoption of this bicycle master plan A program of physical improvements and workable implementation strategies that reflects local needs was developed as part of this master plan A bicycle master plan will be of little value if it is not part of an active and ongoing planning process that continually seeks to integrate cycling considerations into all areas of local planning

Within this master plan, facility design guidelines have been tailored to local conditions, but are also consistent with national guidelines, such as the AASHTO *Guide to Development of Bicycle Facilities* State guidelines are also referenced, specifically, Caltrans *Highway Design Manual, Chapter 1000, Bikeway Planning and Design* and the Caltrans *Traffic Manual* Elements of these guidelines without relevance to the region have been excluded

12 1 3 "Institutionalizing" Bicycle Planning

Achieving implementation of this master plan will be greatly expedited by "institutionalizing" bicycle planning, a concept first developed by Peter Lagerway of the city of Seattle, Washington as part of his efforts as the city's pedestrian and bicycle coordinator The term refers to coordinating local planning and regulatory functions in the development of a program of improvements Three elements are needed to institutionalize bicycle planning on a local level 1) a bicycle advisory committee, 2) a bicycle coordinator, and 3) committed public officials

1) Public involvement can be promoted through the formation of a bicycle advisory committee as a new city committee, or as a subcommittee of an appropriate existing committee Its primary benefit would be in providing an avenue for public participation and support

2) City government involvement can occur through the designation of a bicycle coordinator For a city the size of Carlsbad, this may be a part-time position, but this does not diminish its importance Since a truly comprehensive bicycle planning effort will involve many city departments including public works, parks and recreation, planning, schools and police, the bicycle coordinator would be in a position to organize interdepartmental efforts and make certain that bicycle concerns are integrated into other city activities in the planning stages, as well as coordinate with adjacent communities and jurisdictions

3) The third aspect of institutionalization of bicycle planning involves obtaining the commitment of public officials Leadership for bicycle improvements may already come from public officials, but even if it does not, officials will be more likely to be supportive if they can be certain their constituency wants a more bicycle-friendly community

12 1 4 Primary Planning Considerations

The safety, efficiency and enjoyment of the bike facility by expected users should be the primary considerations employed in the planning of new bicycle facilities More specifically, such considerations should include the following

- Direct and convenient alignment to serve trip origins and destinations
- Access to and from existing and planned bicycle facili ties
- Avoiding abrupt facility discontinuity,
- Avoiding steep grades whenever possible
- Adequate lighting and sight lines,
- Convenient bicycle parking at destinations, and
- Adequate commitment to maintenance

12 1 5 Integration with Other City Plans and Programs

Bicycle facility planning requires a high level of coordination because it is directly affected by the planning decisions of other City departments, as well as those of adjacent communities, the county, regional and state agencies Land use, zoning, street design, open space and park planning all affect how bicycle-friendly a community can be For examples, land use patterns affect cycling by determining the locations of trip origins and destinations by such means as creating areas of employment and housing densities sufficient to sustain bicycle facilities, or by providing a balance of housing and jobs by encouraging multi-use development Access or bicycle parking facilities can often be included in developments at a low cost Also, the provision of better access and connections between developments for cyclists and pedestrians may be more easily provided if the need is understood and articulated as early as possible in the planning process

Effective bicycle planning may require review of regional transportation plans, local street plans, park and open space plans and even site plan review Transportation plans provide opportunities for low cost improvements to be designed into subsequent projects Local street plans provide opportunities to implement changes that make streets more conducive to cycling using techniques such as "traffic calming" (Section 12 2 22) Park and open space planning provide opportunities to acquire greenways and to build multi-use trails Site plan review provides opportunities to ensure that project design accommodates cyclists through the provision of improvements such as access or parking facilities and that the project's vehicular traffic does not decrease the safety of cyclists of adjacent facilities

12 1 6 Education and Encouragement

Education and encouragement of cycling are important elements of any bicycle planning effort and can occur through instructional venues such as school curricula and through the efforts of large employer-based transportation programs There is no shortage of educational materials available through a number of private and government organizations The dissemination of meaningful information can also be augmented by the participation of local businesses such as bike shops, especially since they have a vested interest in promoting safe cycling in Carlsbad

12 1 7 Regulating Land Use and Community Design to Benefit Cycling

Land use and design options are largely determined by regulatory functions that, in turn, help to define community character and functionality These regulatory functions such as subdivision regulations, zoning requirements and developer exactions are also often used to set requirements for amenities in new development projects These same regulations can be used to help define development patterns more conducive to cycling such as incorporating more mixed use, higher densities and connections between communities and land uses Street patterns and hierarchy can greatly affect average daily (motor vehicle) trips (ADTs), connectivity and motor vehicle speeds, which in turn positively or negatively affect cycling Street design can be modified to discourage high motor vehicle speeds and to provide width for a bike lane Linear open space can become land for greenway routes that benefit all non-motorized users, not just cyclists

Though prioritization of bikeway projects is defined by State and local decisions, it is Federal funding and policies that currently encourage the use of transportation funds for bicycle and pedestrian projects However, Federal funding can not be counted upon as a reliable source for the foreseeable future since it depends on the political nature of legislative action Bicycle planning can not sustain itself on the occasional Federal grant Future local implementation will more likely depend on instituting bicycle improvements as part of infrastructural projects, which is when they are most cost-effective

Similarly, the most economical way to include bicycle facilities in private development is through initial project planning and design, not as an afterthought Ordinances can be written that bikeway systems be included as part of new developments An effort should be made to show developers that such requirements are worthwhile because they create well-established marketing advantages gained from providing pedestrian and bicycle amenities Ordinances can also require bicycle amenities such as bicycle parking, showers and lockers at employment sites In all cases, a bicycle master plan is important for establishing priorities for such public/private projects

Review of developments for transportation impacts should address how on-site bicycle facilities are planned Bicycle storage racks should be provided at commercial facilities at locations convenient to building entrances and covered from the elements This is especially important at retail and service establishments At employment sites, secure bicycle racks and/or lockers should be provided (For a further discussion regarding bicycle storage facilities, see Appendix C, Supplemental Facilities)

Requiring developments near commuter rail stations to provide access pathways to these transit centers as part of urban in-fill may improve multi-modal connections for pedestrians and cyclists alike Other developers should contribute to bicycle master plan implementation projects in newly developing areas Park land dedication or fees in lieu of dedication is another possible component of strategies to acquire local trail and bicycle path rights-of-way

12 1 8 Locating Bicycle Facilities on Roadways

The appropriateness of a roadway facility for bicycling is influenced by a number of factors These factors can generally be classified into the following categories

• Land Use and Location Factors

These factors represent the most significant category affecting compatibility Since bicycle trips are generally shorter than motor vehicle or mass transit trips, there must be a manageable distance between origins and destinations, such as between residential areas and places of employment There are certain key land uses which are especially likely to generate bicycle traffic if good bicycle facilities are available These consist of, but are not limited to, transit centers, schools, employment centers with nearby residential areas, recreation areas and mixed use areas

• Physical Constraint Factors

These consist of roadway geometric or physical obstacles to bicycling which are difficult or costly to remedy For example, a roadway may be appropriate because of location factors but not appropriate because of the existence of physical constraints to bicycling such as a narrow bridge, insufficient right-of-way or intersections with restricted lane widths resulting from lane channelization The feasibility of correcting these physical constraints must be weighed in designating bikeways

• Traffic Operations Factors

These include traffic volume, speed, the number of curb cuts or conflict points along the roadway, sight distance and bicycle-sensitive traffic control devices Experienced cyclists will use roadways even if they have limiting traffic operational factors, but less confident cyclists will perceive such roadways as unsafe and intimidating These roadway facilities should be designed or improved to accommodate cyclists through the shared use of roadways However, they are inappropriate for full designation as bikeways

Other safety issues such as maintenance and pavement repair are also important considerations in the designation of bikeways, but do not directly affect the planning aspects of appropriate facilities

12 1 9 Integrating Bicycle Facilities into the Roadway Planning Process

Planning for bicycle facilities on roadways should begin at the very earliest stage of project development on all sizes and types of roadway projects Even the smallest roadway reconstruction project could result in a missed opportunity if cyclists are not taken into consideration at the initiation of the project At the municipal level, planners should address these roadway planning issues in the comprehensive context of the circulation element in the municipal master plan

The following procedure offers the planner and designer guidance in determining the need for bikeways during the usual phases of project development

• Needs Assessment

The first step in the planning process for any transportation project is the assessment of needs Existing and planned land use, current and projected traffic levels and the special needs of the area population are examined There are circumstances in which a portion of the transportation need might be served by non-motorized means, as well as locations where existing bicycle demand would be better served by improved facilities The following land use and location factors assist in recognizing the potential for non-motorized travel and evaluating the needs of cyclists at the street level

The roadway

- Serves an activity center which could generate bicycle trips
- Is included on a county or municipal bicycle master plan
- Provides continuity with or between existing bicycle facilities including those of adjacent cities
- Is located on a roadway which is part of a mapped bike route or utilized regularly by local bicycle clubs
- Passes within two miles of a transit center
- Passes within two miles of a high school or college
- Passes within a half mile of an elementary school or middle school,
- Passes through an employment center especially if there is a significant residential area within a three mile radius or
- Provides access to a recreation area or otherwise serves a recreation purpose

If any one of these factors exist, the roadway has the potential to attract less experienced bicycle riders and/or significant numbers of advanced riders As a result, it should be considered as potentially appropriate for designation as a bikeway

The planner should include a description of the potential significance of the roadway as a bicycle facility in the project initiation or scoping document that will be forwarded to the project designer If the planner determines that the project is potentially appropriate for designation as a bikeway, the nature of potential bicycle use should be addressed, including factors affecting roadway design, such as roadway truck volumes or intersections

• Preliminary Engineering

Roadway facilities which have been determined through needs assessment to be potentially appropriate for bikeways should be analyzed to determine whether any physical constraints exist that may limit the facility type that could be provided The following factors should be considered

- Sufficient right-of way exists or additional right-of way can be acquired to allocate the required space for a bikeway,
- Physical impediments or restrictions exist, but they can be avoided or removed to allow for the required pave ment width to provide a bikeway,
- Bridges allow for bicycle access in accordance with bikeway standards and
- Travel or parking lanes can be reduced in width or elimi nated to allow space for bikeways

If these factors occur, a bikeway should be recommended at the completion of the preliminary engineering phase for the following situations

- Transportation facilities or segments that connect bicycle traffic generators within five miles of each other or
- Segments of transportation facilities that provide continu ity with existing bicycle facilities

If physical constraint factors that preclude allocation of space and designation of bikeways exist along a particular roadway and cannot be avoided or remedied, these factors should be reported to the project manager in the final design phase and alternative design treatments should be generated

Planning and engineering should consider more than roadway cross-sections Often, the most difficult potential areas of conflict are at intersections In general, high speed interchanges, merge lanes and wide radius curbs are unsafe for cyclists and should be avoided

• Final Design And Facility Selection

Class 2 facilities are usually more suitable in urban settings on roads with high traffic volumes and speeds Class 3 facilities are often used in urban settings to guide cyclists along alternate or parallel routes that avoid major obstacles, or have more desirable traffic operational factors

In rural settings, Class 2 facilities are not usually necessary to designate preferential use On higher volume roadways, wide shoulders offer cyclists a safe and comfortable riding area On low volume roadways, most cyclists prefer the appearance of a narrow, low speed country road

Table 12-1 recommends the type of bikeway and pavement width for various traffic conditions For locations where pavement widths do not meet the criteria listed in the table, the local municipal bicycle authority should be consulted to assist in the decision-making process

Where physical obstructions exist that can be removed in the future, the roadway facility should be designed to meet bikeway space allocation requirements and upgraded and designated when the physical constraint is remedied (i e , bridge is replaced and improved to allow designated facility)

The final design should be coordinated with the bicycle coordinator for review and approval prior to construction

When the needs assessment and preliminary design indicate the need for bikeways, the designer should consider traffic operations factors in determining the actual design treatment for the bikeway The following should be considered in the design of the roadway and bicycle facility

- Existing and projected traffic volumes and speeds
- Existence of parking (Can parking be restricted or removed to allow better sight distances?)
- Excessive intersection-conflict points (Can intersection conflict points be reduced along roadways?),
- Turn lanes at intersections that can be designed to allow space for cyclists
- Sections with insufficient sight distance or roadway geometrics be changed, or
- Traffic operations be changed or "calmed' to allow space and increased safety for cyclists

12 2 General Physical Guidelines

The following sections cover physical design guidelines applicable to all bicycle facility types Guidelines specific to Class 1, 2 and 3 facilities are covered in subsequent sections

12 2 1 Pavement Width

At a minimum, all roadway projects shall provide suffi cient width of smoothly paved surface to permit the shared use of the roadway by bicycles and motor vehicles

Table 12-1 is based on the FHWA publication, *Selecting Roadway Design Treatments to Accommodate Bicycles* Pavement widths represent minimum design treatments for accommodating bicycle traffic These widths are based on providing sufficient pavement for shared use by bicycle and motor vehicle traffic and should be used on roadway projects as minimum guidelines for bicycle compatible roads

Considerations in the selection of pavement width include traffic volume, speed, sight distance, number of large vehicles (such as trucks) and grade The dimensions given in Table 12-1 for shared lanes are exclusive of the added width for parking, which is assumed to be eight feet On shared lanes with parking, the lane width can be reduced if parking occurs only intermittently On travel lanes where curbs are present, an additional one foot is necessary

On very low volume roadways with ADTs of less than 1,200, even relatively high speed roads pose little risk for cyclists since there will be high probability that an overtaking motor vehicle will be able to widely pass a bicycle When an overtaking car is unable to immediately pass a bicycle, only a small delay for the motorist is likely These types of roadways are jointly used by both cyclists and motorists in a safe manner and widening of these roads is not usually recommended Costs of providing widening of these roads can seldom be justified based on either capacity or safety

Similarly, moderately low volume roadways with ADTs between 1,200 and 2,000 generally are compatible for bicycle use and will have little need for widening However, since there is a greater chance of two opposing cars meeting at the same time as they must pass a cyclist, providing some room at the outside of the outer travel lane is desirable on faster speed roadways On low speed roadways, motorists should be willing to accept some minimal delay

With ADTs from 2,000 to 10,000, the probability becomes substantially greater that a vehicle overtaking a bicycle may also meet another oncoming vehicle As a result, on these roads, some room at the edge of the roadway should be provided for cyclists This additional width should be two to three feet added to a typical 11 foot outer travel lane At low speeds, such as below 25 mph, little separation is needed for both a cyclist and a motorist to feel comfortable during a passing maneuver With higher speeds, more room is needed

At volumes greater than 10,000 ADTs, vehicle traffic in the curb lane becomes almost continuous, especially during peak periods As a result, cyclists on these roadways require separate space to safely ride, such as a Class 2 facility In addition, improvements to the roadway edge and the shoulder area will be valuable for motorists as well

Caltrans guidelines for highways recommend that a full eight foot paved shoulder be provided for State highways On highways having ADTs greater than 20,000 vehicles per day, or on which more than five percent of the traffic volume consists of trucks, every effort should be made to provide such a shoulder for the benefit of cyclists, to enhance the safety of motor vehicle movements and to provide "break down" space, as well as a Class 2 facility Otherwise, the highway should probably not be designated as a bicycle facility

12 2 2 Sight Distance

Roadways with adequate sight distance will allow a motorist to see, recognize, decide on the proper maneuver and initiate actions to avoid a cyclist Adequate decision sight distance is most important on high speed highways and narrow roadways where a motorist would have to maneuver out of the travel lane to pass a cyclist

The pavement widths given in Table 12 1 are based on the assumption that adequate sight distance is available In situations where there is not adequate sight distance, the provision of additional width may be necessary

12 2 3 Truck Traffic

Roadways with high volumes of trucks and large vehicles, such as recreational vehicles, need additional space to minimize cyclist/motorist conflicts on roadways Additional width will allow overtaking of cyclists by trucks with less maneuvering Additionally, overtaking by a truck will exert less lateral force from truck drafts and provide greater sight distance for following vehicles

Although there is no established threshold, additional space should be considered when truck volumes exceed five percent of the traffic mix, or on roadways that serve campgrounds, or where a high level of tourist travel is expected using large recreational vehicles Where truck volumes exceed 15 percent of the total traffic mix, widths shown on the table should be increased by a minimum of one foot

Recommended Pavement Widths*			Table 12-1
Posted Speed Limit	Urban w/ Parking	Urban w/o Parking	Rural
1,200 to 2,000 ADTs			
<30 mph	12 ft SL	11 ft SL	10 ft SL
31-40 mph	14 ft SL	14 ft SL	12 ft SL
41-50 mph	15 ft SL	15 ft SL	3 ft SH
>50 mph	NA	4 ft SH	4 ft SH
2,000 to 10,000 ADTs			
<30 mph	14 ft SL	12 ft SL	12 ft SL
31-40 mph	14 ft SL	14 ft SL	3 ft SH
41-50 mph	15 ft SL	15 ft SL	4 ft SH
>50 mph	NA	6 ft SH	6 ft SH
More than 10,000 ADTs or Trucks over 5%			
<30 mph	14 ft SL	14 ft SL	14 ft SL
31-40 mph	14 ft SL	4 ft SH	4 ft SH
41-50 mph	15 ft SL	6 ft SH	6 ft SH
>50 mph	NA	6 ft SH	6 ft SH

Notes

*Primarily applicable to Class 3 and "Undesignated" routes

SH = Shoulder SL = Shared Lane

Shared lane is acceptable for volumes less than 1,200 ADTs

Provide 8' shoulder for volumes greater than 10,000 ADTs

Source Selecting Roadway Design Treatments to Accommodate Bicycles, FHWA

12 2 4 Steep Grades

Steep grades influence overtaking of cyclists by motorists Cyclists climbing steep grades are often unsteady (wobbly) and may need additional width Also, the difference in speed between a slow, climbing cyclist and a motor vehicle results in less time for the driver to react and maneuver around a cyclist The slowing of a motor vehicle on a steep grade to pass a cyclist can result in a diminished level of service

12 2 5 Unavoidable Obstacles

Short segments of roadways with multiple unavoidable obstacles that result in inadequate roadway width are acceptable on bicycle compatible roadways if mitigated with signing or striping Typical examples include bridges with narrow widths and sections of roadway that cannot be widened without removing significant street trees These conditions preferably should not exist for more than a quarter of a mile, or on high speed highways "Zebra" warning striping should be installed to shift traffic away from the obstacle and allow for a protected buffer for bicycle travel

In situations where a specific obstacle such as a bridge abutment can not be avoided, a pavement marking consisting of a single six inch white line starting 20 feet before and offset from the obstacle can also be used to alert cyclists that the travel lane width will soon narrow ahead (See Section 1003 6 of the Caltrans Highway Design Manual for specific instructions)

In either situation, where bicycle traffic is anticipated, a "SHARE THE ROAD" sign should be used to supplement the warning striping On longer sections of roadway that are irrevocably narrow, edge striping should be employed to narrow the travel lane and apportion pavement space for a partial shoulder In situations where even these measures may not provide adequate road way space for cyclists, it is recommended that an alternate route be designated

12 2 6 Pavement Design

Though wider tires are now very common and bicycle suspension systems are becoming increasingly prevalent, bicycles still require a riding surface without significant obstacles or pavement defects because they are much more susceptible to such surface irregularities than are motor vehicles Asphalt is preferred over concrete where shoulders are employed The outside pavement area where bicycles normally operate should be free of longitudinal seams Where transverse expansion joints are necessary on concrete, they should be saw cut to ensure a smooth transition In areas where asphalt shoulders are added to existing pavement, or where pavement is widened, pavement should be saw cut to produce a tight longitudinal joint to minimize wear and expansion of the joint

12 2 7 Raised Roadway Markers

Raised roadway markers such as reflectors or rumble strips should not be used on roadway edges where bicycles are most likely to operate because they are a surface irregularity that can be hazardous to bicycle stability Painted stripes or flexible reflective tabs are preferred In no case should strips of raised reflectors that are intended to warn motorists to reduce vehicle speeds prior to intersections be allowed to cross through the bicycle travel lane

12 2 8 Utilities

Because bicycles are much more sensitive to pavement irregularities than motor vehicles, utility covers should be adjusted as a normal function of any pavement resurfacing or construction operations Failure to do so can result in the utility cover being sunken below the paving surface level which creates a hazard experienced cyclists refer to as "black holes " Also, it is common practice to excavate trenches for new utilities at road edges, the same location as bicycle facilities When such trenching is completed, care should be given to replacing the full surface of the bicycle lane from the road edge to the vehicle travel lane instead of narrow strips that tend to settle or bubble, causing longitudinal obstructions Replacement of the bike lane striping should also be required

12 2 9 Drainage Facilities

Storm water drainage facilities and structures are usually located along the edge of roadways where they often present conflicts with cyclists Careful consideration should be given to the location and design of drainage facilities on roadways with bicycle facilities

All drainage grate inlets pose some hazard to bicycle traffic The greatest hazard comes from stream flow drainage grates which can trap the front wheel of a bicycle and cause the cyclist to lose steering control, or have the narrow bicycle wheels drop into the grate A lesser hazard is caused by cyclists swerving into the lane of traffic to avoid any type of grate or cover Riding across any wet metal surface increases the chances of a sudden slip fall

Only a "bicycle safe" drainage grate with acceptable hydraulic characteristics should be used The inlet grate should be used in all normal applications and should be installed flush with the final pavement Where additional drainage inlet capacity is required because of excessive gutter flow or grade (greater than two percent), double inlets should be considered Depressed grates and stream flow grates should not be used except in unique or unusual situations which require their use and only outside the lane sharing area Where necessary, depressed grates should only be installed on shoulders six feet wide or greater Where projects offer the possibility for replacement of stream flow grates located in the lane sharing area, these grates should be replaced with the "bicycle safe" grate

When roads or intersections are widened, new bicycle safe drainage grates should be installed at a proper location at the outside of the roadway, existing grates and inlet boxes should be removed and the roadway reconstructed Drainage grate extensions, the installation of steel or iron cover plates or other "quick fix" methods which allow for the retention of the subsurface drain inlet are unacceptable measures since they will create a safety hazard in the portion of the roadway where cyclists operate

Manholes and covers should be located outside of the lane sharing area wherever possible Utility fixtures located within the lane sharing area, or any travel lane used by bicycle traffic, should be eliminated or relocated Where these fixtures cannot be avoided, the utility fixture cover should be made flush with the pavement surface

12 2 10 Combination Curb and Gutter

These types of curbs reduce space available for cyclists The width of the gutter pan should not be used when calculating the width of pavement necessary for shared use by cyclist On steep grades, the gutter should be set back an additional one foot to allow space to avoid high speed crashes caused by the longitudinal joint between the gutter pan and pavement Where the combination curb and gutter is used, pavement width should be calculated by adding one foot from the curbed gutter

12 2 11 Bridges

Bridges provide essential crossings over obstacles such as rivers, rail lines and high speed roadways, but they have been almost universally constructed for the expedience of motor vehicle traffic and often have features that are not desirable for bicycling Among these features are widths that are narrower than the approach roadways (especially when combined with relatively steep approach grades), low railings or parapets, high curbs and expansion joints that can cause steering problems

Though sidewalks are generally not recommended for cycling, there are limited situations such as long or narrow bridges where designation of the sidewalk as an alternate bicycle facility can be beneficial to cycling, especially when compared to riding in the narrow bridge roadway This is only recommended where the appropriate curb cuts, ramps and signage can also be included Using the bridge sidewalk as a bicycle facility is especially useful where pedestrian use is expected to be minimal Appropriate signage directed to all potential users should be installed so that they will be aware of the shared use situation Bridge railings or barrier curb parapets where bicycle use is anticipated should be a minimum of 4 5 feet high

• Modifications of Narrow Bridges Over Rail Lines and Highways

Short of wholesale replacement of the existing narrow bridges over rail lines and highways, there are a few measures to substantially improve safety for cyclists Signage warning motorists of both the presence of cyclists and the minimal bridge width should be installed at the bridge approaches "Zebra" warning stripe areas should be painted along high curbs to deter cyclists from riding too close to them which can result in the pedal hitting these high curbs, causing an accident This situation is of particular concern since the cyclist will want to stay as far to the right as possible to avoid passing motor vehicles traffic, even though riding far to the right increases the chances of hitting the high curb

Though the first alternative mentioned above, bridge replacement, is the preferred alternative for bridges that are too narrow, it is the least likely to occur due to cost A second alternative is to direct cyclists to alternate, safer routes, but this will not always be practical since highway and rail crossing points are usually limited in number and considerable distances apart In any case, these other crossing points may well have similar width restrictions

A third alternative is to build separate bridges for cyclist and pedestrian use Where access warrants a workable solution, this could be a cost-effective long-term solution compared to rebuilding the motor vehicle bridge These additional bridges could be built adjacent to the motor vehicle bridges, or be installed well away from them, depending upon where best to conveniently accommodate cyclists and pedestrians, who would also undoubtedly use such facilities An advantage to constructing the bridges away from the motor vehicle bridges is that only one bridge would be needed since building bicycle/pedestrian bridges immediately adjacent to existing motor vehicle bridges would require constructing two one-way spans, one on each side of the roadway, for optimum user safety

Recommended locations for new bikeway bridges or bridge expansions include Poinsettia Lane and Palomar Airport Road over the rail line and at Tamarack Avenue, Jefferson Street and Las Flores Drive over I-5

If sidewalk widths are sufficient, directing cyclists to use the sidewalks and installing ramps at the bridge ends is a possible solution In general, sidewalks are not recommended as a cycling venue and riding on sidewalks is illegal, but in cases where narrow bridges are not expected to be rebuilt for an extended period of time, this may be a reasonable alternative If possible, a railing should be installed between the roadway and the sidewalk

Finally, it should be noted that all the other alternatives are inherently inferior to the first alternative of rebuilding narrow bridges in terms of safety, and should only be considered where the first alternative can not be implemented

12 2 12 Traffic Control Devices

As legitimate users of California's roadways, cyclists are subject to essentially the same rights and responsibilities as motorists In order for cyclists to properly obey traffic control devices, those devices must be selected and installed to take their needs into account All traffic control devices should be placed so they can be observed by cyclists who are properly positioned on the road This includes programmed visibility signal heads

• Traffic Signals and Detectors

Traffic-actuated signals should accommodate bicycle traffic Detectors for traffic-activated signals should be sensitive to bicycles, should be located in the cyclist's expected path and stenciling should direct the cyclist to the point where the bicycle will be detected Examples of successful bicycle-sensitive signal detector installation and their specific applications are shown at right

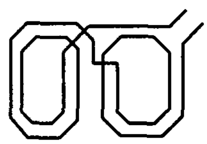
Since detectors can fail, added redundancy in the event of failure is recommended in the form of pedestrian push buttons at all signalized intersections These buttons should be mounted in a location which permits their activation by a cyclist without having to dismount

It is increasingly common for bicycles to be made of so little ferrous metals that they may not be detectable by many currently installed types of loop detectors Of the types available, those illustrated at right should be used

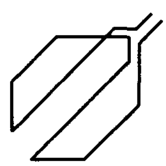
Where left turn lanes are provided and only protected left turns are allowed, bicycle sensitive loop detectors should be installed in the left turn lane, or a pedestrian style push button should be provided that is accessible to the cyclist in the median immediately adjacent to the turn lane to permit activation of the left turn phase

Where moderate or heavy volumes of bicycle traffic exist, or are anticipated, bicycles should be considered in the timing of the traffic signal cycle as well as in the selection and placement of the traffic detector device In such cases, short clearance intervals should not be used where cyclists must cross multi-lane streets According to the *1991 AASHTO Guide for the Development of Bicycle Facilities*, a bicycle speed of 10 mph and a perception/reaction time of 2 5 seconds can be used to check the clearance interval Where necessary, such as for particularly wide roadways, an all-red clearance interval can be used

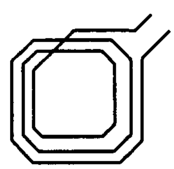
In general, for the sake of cyclist safety, protected left turns are preferred over unprotected left turns In addition, traffic signal controlled left turns are much safer for cyclists than left turns at which motorists and cyclists must simply yield This is because motor vehicle drivers, when approaching an unprotected left turn situation or planning to turn left at a yield sign, tend to watch for other motor vehicles and may not see an approaching cyclist More positive control of left turns gives cyclists an added margin of safety where they need it most



Quadrupole Loop
- Detects most strongly in center
- Sharp cut off of sensitivity
- Used in bike lanes



Diagonal Quadrupole Loop
- Sensitive over whole area
- Sharp cut-off of sensitivity
- Used in shared lanes



Standard Loop
- Detects most strongly over wires
- Gradual cut off
- Used for advanced detection

Source City of San Diego

Loop detectors should be selected for specific sites based on range and cut off distance These configurations have been shown to function well in the applications indicated

• Signing

When designating a bicycle route, the placement and spacing of signs should be based on the Caltrans *Traffic Manual* and *Highway Design Manual* For bike route signs to be functional, supplemental plaques can be placed beneath them when located along routes leading to high demand destinations (e g "To Downtown," "To Transit Center," etc) Since bicycle route continuity is important, directional changes should be signed with appropriate arrow subplaques Signing should not end at a barrier Instead, information directing the cyclist around the barrier should be provided

According to the *Manual on Uniform Traffic Control Devices (MUTCD) Part 2A-6 "Care should be taken not to install too many signs A conservative use of regulatory and warning signs is recommended as these signs, if used to excess, tend to lose their effectiveness On the other hand, a frequent display of route markers and directional signs to keep the driver informed of his location and his course will not lessen their value "*

"BIKE ROUTE" - This sign is intended for use where no unique designation of routes is desired However, when used alone, this sign conveys very little information It can be used in connection with supplemental plaques giving destinations and distances (See Section 1003-3 of the Caltrans *Highway Design Manual* and Part 9B-22 of the *MUTCD* for specific information on subplaque options)

Roadways that are appropriate for bicycle use, but are undesignated, usually do not require regulatory, guide or informational signing in excess of what is normally required for motorists In certain situations, however, additional signing may be needed to advise both motorists and cyclists of the shared use of the roadway, including the travel lane

"NO PARKING/BIKE LANE" - This is a combination sign employed by the City of Carlsbad where designation of a route is needed, but where the prevention of automobile parking within the bicycle lane is also a priority For example, it is likely to be used on roadways along the beaches where parking problems tend to occur more frequently

"SHARE THE ROAD" - Though not currently used by the City of Carlsbad, this sign is recommended where the following roadway conditions occur

- Shared lanes (especially if lane widths do not comply with Table 12 1) with relatively high posted travel speeds of 40 mph or greater,

- Shared lanes (conforming with Table 12 1) in areas of limited sight distance

- Situations where shared lanes or demarcated shoulders or marked bike lanes are dropped or end and bicycle and motor vehicle traffic must begin to share the travel lane,

- Steep descending grades where bicycle traffic may be operating at higher speeds and requires additional maneuvering room to shy away from pavement edge conditions,

- Steep ascending grades especially where there is no paved shoulder, or the shared lane is not adequately wide and bicycle traffic may require additional maneuvering room to maintain balance at slow operating speeds,

- High volume urban conditions, especially those with travel lanes less than the recommended width for lane sharing

- Other situations where it is determined to be advisable to alert motorists of the likely presence of bicycle traffic and to alert all traffic of the need to share available roadway space

12 2 13 Intersections and Driveways

High speed, wide radius intersection designs increase traffic throughput for motor vehicles by minimizing speed differentials between entering and exiting vehicles and through vehicles However, these designs exacerbate speed differential problems faced by cyclists traveling along the right side of a roadway and encourage drivers to fail to yield the right-of-way to cyclists As a result, where wide radius turns are being considered, specific measures should be employed to ensure that the movement of cyclists along the roadway will be visible to motorists and to provide cyclists with a safe area to operate to the left of these wide radius right turn lanes One method to accomplish this is to stripe (dash) a bicycle lane throughout the intersection area Also, "SHARE THE ROAD" signs should be posted in advance of the intersection to alert existing traffic In general, however, curb radii should be limited to distances which communicate to the motorist that he or she must yield the right-of-way to cyclists traveling along the roadway, or to pedestrians walking along the sidewalk or roadway margin

Sand, gravel and other debris in the cyclist's path present potential hazards In order to minimize the possibility of debris from being drawn onto the pavement surface from unpaved intersecting streets and driveways, during new construction, reconstruction and resurfacing, all unimproved intersecting streets and driveways should be paved back to the right-of-way line or a distance of 10 feet Where curb cuts permit access to roadways from abutting unpaved parking lots, a paved apron should be paved back to the right-of-way line, preferably 10 feet from the curb line These practices will lessen the need for maintenance debris removal The placement of the paved back area or apron should be the responsibility of those requesting permits for access via curb cuts from driveways and parking lots onto the roadway system

12 2 14 Roadside Obstacles

To make certain that as much of the paved surface as possible is usable by bicycle traffic, obstructions such sign posts, light standards, utility poles and other similar appurtenances should be set back a one foot minimum "shy distance" from the curb or pavement edge with exceptions for guard rail placement in certain instances Additional separation distance to lateral obstructions is desirable Where there is currently insufficient width of paved surface to accommodate bicycle traffic, any placement of equipment should be set back far enough to allow room for future projects (widening, resurfacing) to bring the pavement width into conformance with these guidelines Vertical clearance to obstructions should be a minimum of 8 feet, 6 inches (See Section 1003 1 of the Caltrans *Highway Design Manual*)

12 2 15 Railroad Crossings

As with other surface irregularities, railroad grade crossings are a potential hazard to bicycle traffic To minimize this hazard, railroad grade crossings should, ideally, be at a right angle to the rails This minimizes the possibility of a cyclist's wheels being trapped in the rail flangeway, causing loss of control Where this is not feasible, the shoulder (or wide outside lane) should be widened, or "bumped out" to permit cyclists to cross at right angles (See Section 1003 6 of the Caltrans *Highway Design Manual*)

It is important that the railroad grade crossing be as smooth as possible and that pavement surfaces adjacent to the rail be at the same elevation as the rail Pavement should be maintained so that ridge buildup does not occur next to the rails

Options to provide a smooth grade crossing include removal of abandoned tracks, use of compressible flangeway fillers, timber plank crossings or rubber grade crossing systems These improvements should be included in any project which offers the opportunity to do so

12 2 16 TSM Type Improvements

Transportation Systems Management (TSM) improvements are minor roadway improvements which enhance motor vehicle flow and capacity They include intersection improvements, channelization, the addition of auxiliary lanes, turning lanes and climbing lanes TSM improvements must consider the needs of bicycle traffic in their design, or they may seriously degrade the ability of the roadway to safely accommodate cyclists The inclusion of wider travel lanes or adjacent bike lanes will decrease traffic conflicts and increase vehicular flow Designs should provide for bicycle compatible lanes or paved shoulders Generally, this requires that the outside through lane and (if provided) turning lane be 14 feet wide Auxiliary or climbing lanes should conform with Table 12-1 by either providing an adjacent paved shoulder, or a shared lane width of at least 15 feet Where shared lanes and shoulders are not provided, it must be assumed that bicycle traffic will take the lane

12 2 17 Marginal Improvements/Retrofitting Existing Roadways

There may be instances or locations where it is not feasible to fully implement guidelines pertaining to the provision of adequate pavement space for shared use due to environmental constraints or unavoidable obstacles In such cases, warning signs and/or pavement striping must be employed to alert cyclists and motorists of the obstruction, alert motorists and cyclist of the need to share available pavement space, identify alternate routes (if they exist), or otherwise mitigate the obstruction

On stretches of roadway where it is not possible to provide recommended shoulder or lane widths to accommodate shared use, conditions for bicycle traffic can be improved by

- Striping wider outside lanes and narrower interior lanes, or
- Providing a limited paved shoulder area by striping a narrow travel lane This tends to slow motor vehicle operating speeds and establish a space (with attendant psychological benefits) for bicycle operation

Where narrow bridges create a constriction, zebra striping should be used to shift traffic away from the parapet and provide space for bicycle traffic

Other possible strategies include

- Elimination of parking or restricting it to one side of the roadway
- Reduction of travel lanes from two in each direction to one in each direction plus center turn lane and shoulders, or
- Reduction of the number of travel lanes in each direction and the inclusion or establishment of paved shoulders

12 2 18 Access Control

Frequent access driveways, especially commercial access driveways, tend to convert the right lane of a roadway and its shoulder area into an extended auxiliary acceleration and deceleration lane Frequent turning movements, merging movements and vehicle occupancy of the shoulder can severely limit the ability of cyclists to utilize the roadway and are the primary causes of motor vehicle-bicycle collisions As a result, access control measures should be employed to minimize the number of entrances and exits onto roadways For driveways having a wide curb radius, consideration should be given to marking a bicycle lane through the driveway intersection areas As with other types of street intersections, driveways should be designed with sufficiently tight curb radii to clearly communicate to motorists that they must fully stop and then yield the right-of-way to cyclists and pedestrians on the roadway

12 2 19 Bikeway Reconstruction after Construction

Since roadways with designated bicycle facilities carry the largest volumes of users, their reconstruction should be of particular concern Unfortunately, bicycle facilities are often installed piecemeal and users can find themselves facing construction detours and poor integration of facilities where the facilities begin and end

Bicycles facilities also sometimes seem to "disappear" after roadway construction occurs This can happen incrementally as paving repairs are made over time and are not followed by proper bikeway restriping When combined with poor surface reconstruction following long periods out of service due to road work, this can result in the eventual loss of affected bikeway facilities and decrease the number of cyclists regularly using bicycle facilities within the City of Carlsbad

Adjacent construction projects that require the demolition and rebuilding of roadway surfaces can cause problems in maintaining and restoring bikeway function Construction activities controlled through the issuance of permits, especially driveway, drainage, utility, or street opening permits, can have an important effect on the quality of a roadway surface where cyclists operate Such construction can create hazards such as mismatched pavement heights, rough surfaces or longitudinal gaps in adjoining pavements, or other pavement irregularities

Permit conditions should ensure that pavement foundation and surface treatments are restored to their preconstruction conditions, that no vertical irregularities will result and that no longitudinal cracks will develop Stricter specifications, standards and inspections designed to prevent these problems should be developed, as well as more effective control of construction activities wherever bikeways must be temporarily de molished A five year bond should be held to assure correction of any deterioration which might occur as a result of faulty reconstruction of the roadway surface

Spot widening associated with new access driveways frequently results in the relocation of drainage grates Any such relocation should be designed to close permanently the old drainage structure and restore the road way surface New drainage structures should be selected and located to comply with drainage provisions established in these guidelines

12 2 20 Maintenance Priorities

Bikeway maintenance is easily overlooked The "sweeping" effect of passing motor vehicle traffic readily pushes debris toward the roadway edges where it can accumulate within an adjoining bicycle facility Litter and broken glass usually ends up in these areas as well Since the potential for loss of control can exist due to a blowout caused by broken glass, or through swerving to avoid other debris, proper maintenance is directly related to safety For this reason, street sweeping must be a priority on roadways with bike facilities, especially in the curb lanes and along the curbs themselves The police department could assist by requiring towing companies to fully clean up accident scene debris, or face a fine This would prevent glass and debris from being left in place after a motor vehicle accident, or simply swept into the curb or shoulder area

Suggested minimum sweeping schedule

• Class 1	heavy use	monthly
	light use	twice/year
• Class 2	heavy use	monthly
• Class 3		twice/year

The availability of a forum through which citizens can conveniently notify the proper city authority of bicycle facility problems or shortcomings is desirable The City of San Diego Street Division, for example, makes available a Service Request form via the city's Internet home page to allow citizens to report problems relating to streets, sidewalks, drains and other civil engineering infrastructural issues It does not specifically mention bicycle facilities in its list of selected problems, but does offer the user the opportunity to type in the particulars of any street-related issue

12 2 21 Intermodal Planning and Facilities

Creating an environment conducive to intermodal transit begins with providing the proper types of facilities and amenities in locations convenient enough to attract potential users Such facilities can include those described in the following sections

• Bike Lockers and Racks

The provision of bicycle racks and lockers is an important first step in making a multi-modal system work for cyclists Their presence encourages cyclists to use available transit because these facilities help to alleviate concerns about security, primarily theft or vandalism of bicycles parked for long periods

• Additional Bus-mounted Racks

The provision of bus-mounted bicycle racks on more bus routes may encourage cyclists to use the bus system, especially in the outlying sections of the city where topography is the most pronounced These racks should be mounted on the front of the bus to increase visibility between the bus driver and the cyclist using the rack and to decrease the chance of theft while the bus is stopped

12 2 22 Traffic Calming

There exist roadway conditions in practically all communities where controlling traffic movements and reducing motor vehicle speeds is a worthwhile way to create a safer and less stressful environment for the benefit of non-motorized users such as pedestrians and cyclists These controlling measures are referred to as traffic calming These measures are also intended to mitigate impacts of vehicular traffic such as noise, accidents and air pollution, but the primary link between traffic calming and bicycle planning is the relationship between motor vehicle speed and the severity of accidents European studies have shown that instituting traffic calming techniques significantly decreases the number of pedestrian and cyclist fatalities in accidents involving motor vehicles, as well as the level of injuries and air pollution, without decreasing traffic volume

• Stop Signs/Yield Signs

The installation of stop signs is a common traffic calming device intended to discourage vehicular through traffic by making the route slower for motorists However, stop signs are not speed control devices, but rather right-of-way control devices They do not slow the moving speed of motor vehicles and compliance by cyclists is very low Requiring motor vehicles to stop excessively also contributes to air pollution Cyclists are even more inconvenienced by stop signs than motorists because unnecessary stopping requires them to repeatedly reestablish forward momentum The use of stop signs as a traffic management tool is not generally recommended unless a bicycle route must intersect streets with high motor vehicle traffic volumes Controlled intersections generally facilitate bicycle use and improve safety and stop signs tend to facilitate bicycle movement across streets with heavy motor vehicular traffic An alternative to stop signs may be to use yield signs or other traffic calming devices as methods to increase motorist awareness of crossing cyclists

• Speed Bumps and Tables

Though many cities are no longer installing speed bumps, they have been shown to slow motor vehicle traffic speeds and reduce volume If speed bumps are employed as a traffic management tool, a sufficiently wide gap must be provided to allow unimpeded bicycle travel around the bump to prevent safety hazards for cyclists Standard advance warning signs and markers must be installed as well

• Partial Traffic Diverters

These traffic calming devices include traffic circles and chicanes, both of which force traffic to follow a curved path which had formerly been straight They are usually employed in areas of traditional grid street configuration These devices can actually increase traffic hazards if they are not substantial enough to decrease motor vehicle speeds, or if appropriate side street access points are not controlled

• Total Traffic Diverters

These diverters close roadways to motor vehicles only, or divert them to other routes while continuing to provide access to non-motorized users Partial diverters allow access for cyclists in both directions, but block motor vehicle entry at one end Both devices reduce motor vehicle driver options as a means to reduce the local traffic volume while allowing unrestricted access for pedestrians and cyclists They are only useful where bicycles are fully exempt from the restrictions preventing the access of motor vehicles Bicycle access should be clearly signed where motor vehicle access is limited so that cyclists are made aware that they can proceed even though motor vehicles can not

• Curb Extensions and Radius Reductions

Larger curb radii are intended to facilitate high speed right-turn movements for the convenience of motorists However these larger radii are more dangerous for crossing and adjacent cyclists and pedestrians both because of the resulting higher motor vehicle speeds and the longer crossing distance for the cyclists and pedestrians Motorists tend to spend less time looking for pedestrians and cyclists when they are attempting to make a high speed turn because their attention is focused on watching for oncoming traffic from the left Their tendency to watch for pedestrians crossing from the right is also reduced In addition, this type of intersection encourages higher speed movements across the bicycle travel lane, increasing the risk of collisions To avoid these problems, curb radii should be reduced and curb extensions installed that pinch in toward the motor vehicle traffic lanes This narrowing of the roadway tends to reduce traffic speeds, which creates a longer period for drivers to see potential conflicts before making right turns However, due to the resulting reductions in motor vehicle speeds, this approach may not be appropriate at congested intersections In such cases, there should instead be a safe lane and crossover segment especially for cyclists

Extensions are curb bulbs extending into the intersection from the corners of one or both of the intersecting roadways Reducing curb radii functionally narrows the intersection, shortening the crossing distance for pedestrians and cyclists and slowing approaching traffic Curb extensions are even more effective than reduced curb radii in decreasing crossing distance and slowing traffic They can also serve the additional purposes of defining parking lanes and improving visibility at corners

The use of curb extensions should be confined to residential areas with limited through traffic since they limit the use of the curb lane to parking instead of providing extra roadway space beneficial for cycling Reduced curb radii can be used more widely, but should not be used on streets with bus service, or on streets with routine large truck use requiring right turns

12 3 Class 1 Multi-Use Trail Guidelines

Class 1 facilities are generally paved multi-use paths or trails, separated from motor vehicle traffic Off street routes are rarely constructed for the exclusive use of cyclists since other non-motorized user types will also find such facilities attractive For that reason, the facilities recommended in this master plan should be considered multi-use where cyclists will share the pathways with other users The recommended Class 1 routes (bike paths) are primarily intended to provide commuting routes through areas that are not yet served by roadways

Their primary purpose notwithstanding, most cyclists will find bicycle paths inviting routes to ride, especially if travel efficiency is secondary to enjoyment of cycling Since these paths would augment the existing roadway system, they can extend circulation options for cyclists, making trips feasible which would not otherwise be possible if the cyclists had to depend exclusively on roadways, especially in areas where usable roads are limited Class B and C (casual and children) cyclists would likely also appreciate the relative freedom from conflicts with motor vehicles compared to riding on typical roadways

The presence of a Class 1 route near an existing roadway should not be construed as justification for prohibiting bicycles on the parallel or nearly parallel roadway In several cases, this master plan calls for Class 1 routes parallel to the alignments of planned roadways The decision to retain the adjacent Class 1 routes or to replace them with the roadway equipped with a Class 2 facility will be based on criteria defined by the City prior to the time of roadway construction Should any of these Class 1 routes be retained parallel to the new roadways, these roadways should still be designed to be compatible with bicycle use (According to the City transportation element, most new roadways are planned to include Class 2 bike lanes) Two reasons to retain parallel facilities are that an experienced cyclist may find Class 1 paths inappropriate because of intensive use, or the routes may not be direct enough to suit the experienced cyclist By the same token, the Class 1 path will likely be much more attractive to less experienced cyclists than a parallel facility on the street

In general, Class 1 facilities should not be placed immediately adjacent to roadways Where such conditions exist, Class 1 facilities should be offset from the street as much as possible and separated from it by a physical barrier These measures are intended to promote safety for both the cyclists and the motorists by preventing movement between the street and the Class 1 facility

12 3 1 Class 1 Planning Issues

• Shared Use of Multiple Use Path

Since off-street paths (Class 1) are now rarely constructed for the exclusive use of cyclists, they must be designed for the safety of cyclists and other expected user types Heavy use of multi-use trails can create conflicts between different types of users These conflicts can include speed differentials between inexperienced and experienced cyclists as well as between pedestrians, joggers and in-line skaters, differences in the movements typical of particular user types and even the kinds of groupings common to the different user types as they casually move down the pathway

As long as volumes are low, the level of conflict between different user types can be managed without enforcement However, even moderate increases in user volume can create substantial deterioration in level of service and safety Conflicts between different user types are especially likely to occur on regionally significant recreational trails that attract a broad diversity of users, especially adjacent to the beaches (such as the proposed Coastal Rail Trail) In general, paths that are expected to receive heavy use should be a minimum of 14 feet wide, paths expected to experience moderate use should be at least 12 feet wide and low volume paths can be 10 feet wide Caltrans Class 1 requirements call for eight feet (2 4 meters) as the minimum width with two foot (0 6 meters) clear areas on each side

• Regulation of Multiple Use Paths

The potential for multiple-use path conflicts has increased substantially in recent years with the increased popularity of jogging, mountain bikes and in-line skating Where multi-use trails were once commonly used primarily by pedestrians and secondarily by cyclists, today they tend to be used by a roughly equal distribution of pedestrians, cyclists and in-line skaters

In-line skating has been the fastest growing sport in America for several years Also, the majority of bicycles sold in the United States over the last decade have been mountain bikes, far outstripping sales of drop-bar type road bike sales The mountain bike's relative comfort and upright riding position have helped to encourage inexperienced cyclists who previously rarely rode to do so more often

Methods used to reduce trail conflicts have included providing separate facilities for different groups, prohibiting certain user types, restricting certain uses to specific hours, widening existing facilities or marking lanes to regulate traffic flow Examples of all of these types of actions occur along the coastal trails of southern California where conflicts between different user types can be especially severe during peak periods

• Compatibility of Multiple Use of Paths or Trails

Joint use of paths by cyclists and equestrians can pose problems due to the ease with which horses can be startled Also, the requirements of a Class 1 bicycle facility include a solid surface, which is not desirable for horses Therefore, where either equestrian or cycling activity is expected to be high, separate trails are recommended On facilities where Class 1 designation is not needed and the facility will be unpaved, mountain bikes and horses can share the trail if adequate passing width is provided, the expected volume of traffic by both groups is low and available sight distances allow equestrians and cyclists to anticipate and prepare for possible conflicts Education of all trail users in "trail etiquette" has proven to be helpful on shared trails elsewhere

The recent surge in the popularity of mountain bikes have increased conflicts on narrow trails with minimal surface improvements that were originally designed for hiking alone On some trails, especially ones that are contiguous over distances greater than the average hiker's typical one day hiking range, mountain bikes now commonly outnumber hikers

The primary problem with this mixed use is the speed differential between mountain bikers and hikers This speed difference is exacerbated by additional concerns such as limited sight distances due to topography and vegetation Mountain bikes can also cause some erosion or compaction problems Therefore, mountain bike use should be restricted to wider multi-use trails and dirt roads that have adequate sight distances and drainage improvements to protect against erosion Once again, education is an important component in minimizing conflicts This includes situations where adjacent vegetation or habitat is considered sensitive Signs restricting users to the trail may be sufficient, though the addition of fencing or railings may be required if signage does not achieve the desired results

• Urban Access Pathways

Conflicts between different user types on multiple use routes occur primarily on heavily used recreational paths, or near major pedestrian trip generators Lightly used neighborhood pathways and community trails can be safely shared by a variety of user types Construction of urban access pathways between adjoining residential developments, schools, neighborhoods and surrounding streets can substantially expand the circulation opportunities for both pedestrians and cyclists

However, bicycle use of urban access pathways should not include sidewalks adjacent to streets for a number of reasons First, sidewalks are designed for pedestrian speeds and maneuverability Second, they are usually encumbered by parking meters, utility poles, benches, trees, etc Third, other types of users and their specific types of maneuverability can also pose a safety issue for cyclists

Though sidewalks are, in general, not conducive to safe cycling, an exception is Class C cyclists, young children This type of bicycle use is generally acceptable because it provides young children who do not yet have the judgment or skill to ride in the street an opportunity to develop their riding skills Sidewalks in residential areas generally have low pedestrian volumes and are usually accepted as play areas for children

Finally, one other exception to sidewalk use by cyclists should be allowed This is where the walkway is at least eight feet wide and well away from streets, such as within parks In such cases, bicycle use on walkways can occur safely

• Bicycle Paths Adjacent to Roadways

Two-way bicycle facilities located immediately adjacent to a roadway are not generally recommended because they require one direction of bicycle traffic to ride against motor vehicle traffic, contrary to the normal "Rules of the Road." This puts the wrong way cyclists in the motorists' "blind spot" at intersections where they do not have the right-of-way, or are not noticed by motorists turning right because the cyclists are not on the roadway. Many cyclists will also find it less convenient to ride on this type of facility as compared to streets, especially for utility trips such as commuting. This more experienced group of cyclists may find the roadway more efficient, safer, or better maintained than the adjacent bicycle facility. The AASHTO guide says that "... *bicycle lanes, or shared roadways should generally be used to accommodate bicycle traffic along highway corridors rather than providing a bicycle path immediately adjacent to the highway.*"

An exception to this general rule can occur where an off-road route intended primarily for bicycle use must be located adjacent to a roadway for a short distance to maintain trail continuity such as when an existing roadway's bridge will be used by the trail. Even so, physical separation of the bicycle facility from the roadway must be provided.

12.4 Design of Class 1 Facilities (Paths Primarily Used by Bicycles)

A substantial portion of the following sections are taken directly from the *AASHTO Guide for the Development of Bicycle Facilities, 1991*. In keeping with standards employed in other reviewed master plans, the AASHTO excerpts are italicized. Note that AASHTO's use of the term "bicycle path" is equivalent to a "Class 1 bicycle facility" as defined by Caltrans and as used in this master plan. Also, the AASHTO term "highway" is synonymous with the term "roadway." Finally, all measurements in the Caltrans documents are now in metric form.

12.4.1 Width and Clearance

The paved width and the operating width required for a bicycle path are primary design considerations. Under most conditions, recommended paved width for a two-directional bicycle path is 10 feet. In some instances, however, a minimum of eight feet can be adequate. This minimum should be used only where the following conditions prevail: (1) bicycle traffic is expected to be low, even on peak days or during peak hours, (2) pedestrian use of the facility is not expected to be more than occasional, (3) there will be good horizontal and vertical alignment providing safe and frequent passing opportunities, and (4) the path will not be subject to maintenance vehicle loading conditions that would cause pavement edge damage. Under certain conditions it may be necessary or desirable to increase the width of bicycle path to 12 feet or more, for example, because of substantial bicycle volume, probable shared use with joggers and other pedestrians, use by large maintenance vehicles, steep grades, or where bicycles will be likely to ride two abreast.

Reduced widths are acceptable on access pathways due to their generally short length and low volumes. However, wherever possible, minimum width standards should be employed. One-directional bicycle facilities are not generally recommended since they will almost certainly be used as two-way facilities.

A minimum of 2 feet width graded area should be maintained adjacent to both sides of the pavement. However, 3 feet or more is desirable to provide clearance from trees, poles, walls, fences, guardrails, or other lateral guidelines. A wider graded area on either side of the bicycle path can serve as a separate jogging path. The vertical clearance to obstructions should be a minimum of 8 feet. However, vertical clearance may need to be greater to permit passage of maintenance vehicles and, in undercrossings and tunnels, a clearance of 10 feet is desirable for adequate vertical shy distance.

12.4.2 Horizontal Separation from Roadways

Class 1 bicycle facilities are generally physically separated from roadways. However, where a Class 1 facility must be considered within a roadway right-of-way, *a wide separation between a bicycle path and adjacent highway is desirable to confirm for both the cyclist and the motorist that the bicycle path functions as an independent highway for bicycle traffic. In addition to physical separation, landscaping or other visual buffer is desirable. When this is not possible and the distance between the edge of the roadway and the bicycle path is less than 5 feet, a suitable physical divider may be considered. Such dividers serve both to prevent cyclists from making unwanted movements between the path and the highway shoulder for the protection of cyclists from motor vehicles and to reinforce the concept that the bicycle path is an independent facility. Where used, the divider should be a minimum of 4.5 feet high, to prevent cyclists from toppling over it and it should be designed so that it does not become an obstruction or traffic hazard in itself.*

12.4.3 Design Speed

The speed that a cyclist travels is dependent on several factors, including the type and condition of the bicycle, the purpose of the trip, the condition and location of the bicycle path, the speed and direction of the wind and the physical condition of the cyclist. Bicycle paths should be designed for a selected speed that is at least as high as the preferred speed of the faster cyclists. In general, a minimum design speed of 20 mph should be used. However, when the grade exceeds four percent, a design speed of 30 mph is advisable.

On unpaved paths, where cyclists tend to ride slower, a lower design speed of 15 mph can be used Similarly, where the grades dictate, a higher design speed of 25 mph can be used Since bicycles have a higher tendency to skid on unpaved surfaces, horizontal curvature design should take into account lower coefficients of friction

12 4 4 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 The minimum design radius of curvature can be derived from the following formula

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

R = Minimum radius of curvature (meters)
V= Design speed (kph)
e = Rate of superelevation
f = Coefficient of friction

For most bicycle path applications, the superelevation rate will vary from a minimum two percent (the minimum necessary to encourage adequate drainage) to a maximum of approximately five percent (beyond which maneuvering difficulties by slow bicycles and adult tricyclists might be expected) The minimum superelevation rate of two percent will be adequate for most conditions and will simplify construction

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 cyclist to recognize a feeling of discomfort and instinctively act to avoid higher speed Extrapolating from values used in high way design, design factors for paved bicycle paths can be assumed to vary from 0 30 at 15 mph to 0 22 at 30 mph (Based on a superelevation rate (e) of two percent, minimum radii of curvature can be selected from Figure 1003 1C of the Caltrans Highway Design Manual)

When substandard radius curves 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 in accordance with the Caltrans Highway Design Manual *The negative effects of substandard curves can also be partially offset by widening the pavement through the curves*

12 4 5 Grade

Grades on bicycle paths should be kept to a minimum, especially on long inclines Grades greater than five percent are undesirable because the ascents are difficult for many cyclists and the descents cause some cyclists to exceed the speeds at which they are compe tent Where terrain dictates, grades over five percent and less than 500 feet long are acceptable when a higher design speed is used and additional width is provided

12 4 6 Switchbacks

In areas of steep terrain, a series of "switchbacks" may be the only solution to traversing changes in elevation At these locations, a grade of eight percent is acceptable for a distance of no more than 100 feet Grades steeper than eight percent will not meet Americans with Disabilities Act (ADA) standards Switchback radii should be larger than normally employed for pedestrian facilities to allow for cyclists to be able to safely make the turns without having to dismount Pavement width should be a minimum of 12 feet wide to allow ascending cyclists room to walk their bicycles when necessary The switchbacks should be completely visible from the next uphill turn Runouts at the end of each turn should be considered for cyclists unable to slow down quickly enough to make the turn Railings should be installed to discourage shortcuts and appropriate signing should be placed at the top of the descent

12 4 7 Sight Distances

To provide cyclists with an opportunity to see and react to the unexpected, a bicycle path should be designed with adequate stopping sight distance The distance required to bring a bicycle to a full controlled stop is a function of the cyclist'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 of the Caltrans Highway Design Manual *indicates the minimum stopping sight distance for various design speeds and grades based on a coefficient of 0 25 to account for the poor wet weather braking characteristics of many bicycles For two-way bicycle paths, the sight distance in descending direction, that is, where "G" is negative, will control the design*

12 4 8 Intersections

Intersections with roadways are important considerations in bicycle path design If alternate locations for a bicycle path are available, the one with the most favorable intersection conditions should be selected For crossings of freeways and other high-speed, high-volume arterials, a grade separation structure may be the only possible or practical treatment Unless bicycles are prohibited from the crossing highway, providing for turning movements must be considered When intersections occur at grade, a major consideration is the establishment of right-of-way The type of traffic control to be used (signal, stop sign, yield sign, etc) and locations, should be provided in accordance with the Caltrans Traffic Manual

Sign type, size and location should also be in accordance with the Caltrans Traffic Manual Care should be taken to ensure that bicycle path signs are located so that motorists are not confused by them and that roadway signs are placed so that cyclists are not confused by them

Other means of alerting cyclists of a highway crossing include grade changes or changing surfaces at the approach Devices installed to prohibit motorists from entering the bike path can also assist with alerting cyclists to crossings

It is preferable that the crossing of a bicycle path and a highway be at a location away from the influence of intersections with other highways Controlling vehicle movements at such intersections is more easily and safely accomplished through the application of standard traffic control devices and normal Rules of the Road Where physical constraints prohibit such independent intersections, the crossings may be at or adjacent to the pedestrian crossing Right of way should be assigned and sight distance should be provided so as to minimize the potential for conflict result ng from unconventional turning movements At crossings of high volume multi-lane arterial highways where signals are not warranted, consideration should be given to providing a median refuge area for cyclists

When bicycle paths terminate at existing roads, it is important to integrate the path into the existing system of roadways Care should be taken to properly design the terminals to transition the traffic into a safe merging or diverging situation Appropriate signing is necessary to warn and direct both cyclists and motorists regarding these transition areas

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 cyclists to stop before reaching the intersection, especially on downgrades

Ramps for curb cuts at intersections 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

12 4 9 Signing and Marking

Adequate signing and marking are essential on bicycle paths, especially to alert cyclists to potential conflicts and to convey regulatory messages to both cyclists and motorists at highway intersections In addition, guide signing, such as to indicate directions, destinations, distance, route numbers and names of crossing streets, should be used in the same manner as they are used on highways In general, uniform application of traffic control devices, as described in the Caltrans Highway Design and Traffic Manuals, will tend to encourage proper cyclist behavior

A designer should consider a 4 inch wide yellow centerline stripe to separate opposite directions of travel This is particularly beneficial in the following circumstances (1) for heavy volumes of bicycles, (2) on curves with restricted sight distances, and (3) on unlighted paths where nighttime riding is expected Edge lines can also be very beneficial where nighttime bicycle traffic is expected

General guidance on signing and marking is provided in the Caltrans Highway Design Manual Care should be exercised in the choice of pavement marking materials Some marking materials are slippery when wet and should be avoided in favor of more skid-resistant materials

12 4 10 Pavement Structure

Under most circumstances, a two inch thick asphalt top course placed on a six inch thick select granular subbase is suitable for a bikeway pavement structure Where unsatisfactory soils can be anticipated, a soil investigation should be conducted to determine the load-carrying capabilities of the native soil and the need for any special provisions

In addition, some basic differences between the operating characteristics of bicycles and those of motor vehicles should be recognized While loads on bicycle paths will be substantially less that typical roadway loads, paths should be designed to sustain without damage the wheel loads of occasional emergency, patrol, maintenance and other motor vehicles that are expected to use or cross the path Where such motor vehicle use will be required, four inches of asphalt should be used Additional pavement structure may also be necessary in flood plains and in locations where shallow root systems may heave thin pavement sections

Special consideration should be given to the location of motor vehicle wheel loads on the path When motor vehicles are driven on bicycle paths, their wheels will usually be at or very near the edges of the path Since this can cause edge damage that, in turn, will result in the lowering of the effective operating width of the path, *adequate edge support should be provided Edge support can be either in the form of stabilized shoulders or in constructing additional pavement width Constructing a typical pavement width of 12 feet, where right-of-way and other conditions permit, eliminates the edge raveling problem and offers two other additional advantages over shoulder construction First, it allows additional maneuvering space for cyclists and second, the additional construction cost can be less than that for constructing shoulders because the separate construction operation is eliminated*

It is important to construct and maintain a smooth riding surface on bicycle paths Bicycle path pavements should be machine laid Root barriers should be used where necessary to prevent vegetation from erupting through the pavement, and on Portland cement concrete pavements, transverse joints, necessary to control cracking, should be saw cut to provide a smooth ride On the other hand, skid resistance qualities should not be sacrificed for the sake of smoothness Broom finish or burlap drag concrete surfaces are preferred over trowel finishes, for example

At unpaved highway or driveway crossings of bicycle paths, the highway or driveway should be paved a minimum of 10 feet 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 the location

12 4 11 Structures

An overpass, underpass, small bridge, drainage facility or facility on a highway bridge may be necessary to provide continuity to a bicycle path On new structures, the minimum clear width should be the same as the approach paved bicycle path and the desirable clear width should include the minimum two foot wide clear areas Carrying the clear areas across the structures has two advantages First, it provides a minimum horizontal shy distance from the railing or barrier, and second, it provides needed maneuvering space to avoid conflicts with pedestrians and other cyclists who are stopped on the bridge Access by emergency, patrol and maintenance vehicles should be considered in establishing the design clearances of structures on bicycle paths Similarly, vertical clearance may be dictated by occasional motor vehicles using the path Where practical, a vertical clearance of 10 feet is desirable for adequate vertical shy distance

Railings, fences, or barriers on both sides of a bicycle path structure should be a minimum of 4 5 feet high Smooth rub rails should be attached to the barriers at handlebar height of 3 5 feet

Bridges designed exclusively for bicycle traffic may be designed for pedestrian live loading On all bridge decks, special care should be taken to ensure that bicycle safe expansion joints are used

Where it is necessary to retrofit a bicycle path onto an existing highway bridge, several alternatives should be considered in light of what the geometrics of the bridge will allow

One option is to carry the bicycle path across the bridge on one side This should be done where (1) the bridge facility will connect to a bicycle path at both ends, (2) sufficient width exists on that side of the bridge, or can be obtained by widening or restriping lanes, and (3) provisions are made to physically separate bicycle traffic from motor vehicle traffic as discussed above

A second option is to provide either wide curb lanes or bicycle lanes over the bridge This may be advisable where (1) the bicycle path transitions into bicycle lanes at one end of the bridge, and (2) sufficient width exists, or can be obtained by widening or restriping

A third option is to use existing sidewalks as one-way or two-way facilities This may be advisable where (1) conflicts between cyclists and pedestrians will not exceed tolerable limits, and (2) the existing sidewalks are adequately wide Under certain conditions, the cyclist may be required to dismount and cross the structure as a pedestrian

Because of the large number of variables involved in retrofitting bicycle facilities onto existing bridges, compromises in desirable design criteria are often inevitable Therefore, the width to be provided is best determined by the designer, on a case-by-case basis after thoroughly considering all the variables

12 4 12 Drainage

The recommended minimum pavement cross slope of two percent adequately provides for drainage Sloping in one direction instead of crowning is preferred and usually simplifies the drainage and surface construction A smooth surface is essential to prevent water ponding and ice formation

Where a bicycle path is constructed on the side of a hill, a ditch of suitable dimensions should be placed on the uphill side to intercept the hillside drainage Such ditches should be designed in such a way that no undue obstacles are presented to cyclists Where necessary, catch basins with drains should be provided to carry the intercepted water under the path Drainage grates and manhole covers should be located outside of the travel path of the cyclist (See Section 1003 6 of the

Caltrans Highway Design Manual) *To assist in draining the area adjacent to the bicycle path, the design should include considerations for preserving the natural ground cover Seeding, mulching and sodding of adjacent slopes, swales and other erodible areas should be included in the design plans*

12 4 13 Lighting

Fixed-source lighting reduces conflicts along the paths and at intersections In addition, lighting allows the cyclist 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 to 22 lux should 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 (See Section 1003 6 of the Caltrans Highway Design Manual)

12 4 14 Barriers to Motor Vehicle Traffic

Bicycle paths often need some type of physical barrier at highway intersections and pedestrian load bridges to prevent unauthorized motor vehicles from using the facilities Provisions can be made for a lockable, removable post to permit entrance by authorized vehicles The post should be permanently reflectorized for nighttime visibility and painted a bright color for improved daytime visibility When more than one post is used, a five foot spacing is desirable Wider spacing can allow entry to motor vehicles, while narrower spacing might prevent entry by adult tricycles and bicycles with trailers Striping an envelope around the barrier is recommended (See Section 1003 1 of the Caltrans Highway Design Manual)

An alternate method of restricting entry of motor vehicles is to split the entry way into two five foot sections separated by low landscaping Emergency vehicles can still enter if necessary by straddling the landscape The higher maintenance costs associated with landscaping should be acknowledged, however, before this alternative method is selected

12 5 Unpaved Multi-Use Facilities

In some cases, unpaved trails or roads may be used as part of a bikeway system Though not eligible for official designation as bicycle facilities, they can be acknowledged as "informal" unpaved connections between official paved segments Because these routes are generally in less developed areas, they may also be considered scenic unpaved "byways" that can be accessed via the official bikeway system

Most of the bicycles sold today are mountain bikes designed for use on unpaved surfaces and come equipped with wide tires and low gearing Many recreational cyclists ride this type of bicycle and would gladly use them on a well maintained unpaved route Unpaved routes are unlikely to attract many commuting cyclists, but the routes may experience some utility use if they provide convenient shortcuts between popular destinations where such routes would not otherwise exist

Available guidelines for unpaved facilities are limited In general, the coefficient of friction used in calculating curve radii and a factor in determining design speed, should be reduced *Although there are not data available for unpaved surfaces, it is suggested that friction factors be reduced by 50 percent to allow a sufficient margin of safety* This reduction in friction affects all situations where traction is important, especially on grades *Grades steeper than three percent may not be practical for bicycle paths with crushed stone surfaces*

In cases where switchbacks are necessary for unpaved paths that occur in steep terrain, curve radii may be enlarged, the path widened and runout areas provided In areas of erosive soils, it is also advisable to install signage requiring cyclists to dismount when traversing the switchbacks

12 6 Class 2 Facilities

Class 2 facilities are marked bicycle lanes within roadways usually adjacent to the curb lane, delineated by appropriate striping and signage

Bicycle lanes can be considered when it is desirable to delineate available road space for preferential use by cyclists and motorists and to provide for more predictable movements by each Bicycle lane markings can increase a cyclist's confidence in motorists not straying into his/her path of travel Likewise, passing motorists are less likely to swerve to the left out of their lane to avoid cyclists on their right

Bicycle lanes should always be one-way facilities and carry traffic in the same direction as adjacent motor vehicle traffic Two-way bicycle lanes on one side of the roadway are unacceptable because they promote riding against the flow of motor vehicle traffic Wrong-way riding is a major cause of bicycle accidents and violates the "Rules of the Road" stated in the Uniform Vehicle Code Bicycle lanes on one-way streets should be on the right side of the street, except in areas where a bicycle lane on the left will decrease the number of *conflicts (e g , those caused by heavy bus traffic) In unique situations, it may be appropriate to provide a contra-flow bicycle lane on the left side of a one-way street Where this occurs, the lane should be marked with a solid, double yellow line and the width of the lane should be increased by one foot*

12 6 1 Lane Widths

Under ideal conditions, the minimum bicycle lane width is five feet However, certain edge conditions dictate additional desirable bicycle lane width Figure 1003 2A of the Caltrans Highway Design Manual depicts four common locations for such facilities in relation to the roadway The first figure depicts bicycle lanes on an urban curbed street where a striped parking lane is provided *The minimum bicycle lane width for this location is five feet If parking volume is substantial or turnover is high, an additional one or two feet of width is desirable for safe bicycle operation Bicycle lanes should always be placed between the parking lane and the motor vehicle lanes Bicycle lanes between the curb and the parking lane can create obstacles for cyclists and eliminate a cyclist's ability to avoid a car door as it is opened Therefore, this placement should not be considered*

The second figure depicts an urban curbed street where parking is allowed, but without striping for a separate bike lane This parking lane shared with bicycles should be 11 to 12 feet wide 13 feet is recommended where parking turnover is high, such as commercial districts *Cyclists do not generally ride near a curb because of the possibility of debris, of hitting a pedal on the curb, of an uneven longitudinal joint, or of a steeper cross slope*

The third figure shows a roadway where parking is prohibited Bicycle lanes in this location should have a minimum width of five feet where a curb occurs (measured from the curb face) and four feet where no curb is used *If the longitudinal joint between the gutter pan and the roadway surface is uneven and falls within five feet of the curb face, a minimum of four feet should be provided between the joint and the motor vehicle lanes*

The fourth figure depicts bicycle lanes on a roadway where parking is prohibited and without curbs *Bicycle lanes should be located between the motor vehicle lanes and the roadway shoulders In this situation, bicycle lanes may have a minimum width of four feet, since the shoulder can provide additional maneuvering width A width of five feet or greater is preferable Additional widths are desirable where substantial truck traffic is present, or where vehicle speeds exceed 40 mph In certain situations, it may be appropriate to designate the full shoulder as the bike lane*

12 6 2 Intersections

Bicycle lanes tend to complicate both bicycle and motor vehicle turning movements at intersections Because they encourage cyclists to keep to the right and motorists to keep to the left, both operators are somewhat discouraged from merging in advance of turns Thus, some cyclists will begin left turns from the right side of the bicycle lane and some motorists will begin right turns from the left side of the bicycle lane Both maneuvers are contrary to established Rules of the Road and result in conflicts

Design treatment for bicycle lanes at a simple intersection is shown in Figure 1003 2B of the Caltrans Highway Design Manual *On a two lane roadway, the edge line along the bike lane should end approximately 200 feet from the intersection to allow left turning cyclists and right turning motorists to "weave "*

Design treatment at multi-lane intersections is more complex Figure 1003 2C of the Caltrans Highway Design Manual presents *examples of pavement markings for bicycle lanes approaching motorist right-turn-only lanes Where there are numerous left turning cyclists, a separate turning lane should be considered The design of bicycle lanes should also include appropriate signing at intersections to reduce the number of conflicts General guidance for pavement marking of bicycle lanes is contained in* Section 1003 2 of the Caltrans Highway Design Manual (See the Caltrans Traffic Manual for more specific information)

Adequate pavement surface, bicycle-safe grate inlets, safe railroad crossings and traffic signals responsive to bicycles should always be provided on roadways where bicycle lanes are being designated Raised pavement markings and raised barriers can cause steering difficulties for cyclists and should not be used to delineate bicycle lanes

12 6 3 Signing and Striping Requirements

Signing and striping should be in accordance with Section 1004 of the Caltrans Highway Design Manual and the Caltrans Traffic Manual Bicycle lanes should be well-marked and signed to ensure clear understanding of the presence and purpose of the facility by both cyclists and motorists The Caltrans Traffic Manual also specifies standard signing for bicycle lanes The appropriate signs should be used in advance of the beginning of a marked designated bicycle lane to call attention to the lane and to the possible presence of cyclists Signs should be used only in conjunction with the appropriate pavement marking and erected at periodic intervals along the designated bicycle lane and in the vicinity of locations where the preferential lane symbol is used

Where it is necessary to restrict parking, standing, or stopping in a designated bicycle lane, appropriate signs, as described in the Caltrans Traffic Manual, may be used The City of Carlsbad also uses a combination "NO PARKING/BIKE LANE" sign

Bicycle lane stripes should be solid, six to eight inch wide white lines Care should be taken to use pavement striping that is skid-resistant Thermoplastic tape and painted markings can become slippery and cause the cyclist to fall Impregnated grit, nonskid, preformed tape is an acceptable striping material

It is very important to reapply bicycle lane markings when they begin to fade, since faded bicycle lane markings can lead to confusion for motorists and cyclists If necessary, reapplication of bicycle lane stripes should be placed on a more frequent schedule than regular roadway restriping projects Old markings should be removed prior to restriping if new layers of marking materials would otherwise create raised areas that would be hazardous to cyclists

Prompt replacement of bicycle lane striping following pavement repairs should be the responsibility of the paving contractor for projects that have required the removal and replacement of bike lane paving Too often, lane striping is not replaced following construction or repaving projects

Preferential bicycle lane symbols should be installed on the pavement in bicycle lanes Symbols should be installed at regular intervals (no more that 350 feet between symbols), immediately after intersections and at areas where bicycle lanes begin Pavement letters that spell "BIKE ONLY," and arrows are optional, but desirable

12 7 Class 3 Facilities

A Class 3 facility is a suggested bicycle route that usually consists of a series of signs designating a preferred route between destinations such as residential and shopping areas A network of such routes can provide access to a number of destinations throughout the community In some cases, looped systems of scenic routes have been created to provide users with a series of recreational experiences In addition, such routes can provide relatively safe connections for commuting to workplaces or schools

The designation of a roadway as a Class 3 facility should be based primarily on the advisability of encouraging bicycle use on that particular roadway While the road ways chosen for bicycle routes may not be free of problems, they should offer the best balance of safety and convenience of the available alternatives In general, the most important considerations are pavement width and geometrics, traffic conditions and appropriateness of the intended purpose A certain amount of risk and liability exists for any area that the City signs as a Class 3 route The message to the user public is that the facility is a safe route Therefore, routes should not be placed on streets that do not meet appropriate safety standards

Attributes which describe how appropriate a particular road is for a bicycle route include directness, connectivity with other bicycle facilities, scenery and available services Directness is important for cyclists traveling for a purpose, such as commuting, though this is not the case for recreational riders, for whom scenery may be the primary factor in selecting a route For recreational riders traveling more than a few miles, services such as food, water, restrooms and pressurized air may be of interest

12 7 1 Roadway Engineering

While design of all Class 1 and 2 bikeways should follow the Bikeway Planning and Design Chapter 1000 of Caltrans' *Highway Design and Traffic Manuals*, there are bound to be situations where the recommended geometrics for a Class 3 facility can not be achieved due to right-of-way constraints, for example Planning and design of the Class 3 facility should emphasize safety for cyclists and provide additional warnings to motorists to be aware of the presence of cyclists

A: ROADWAY SEGMENT SUITABILITY RATING FORMS
B: CITY OF CARLSBAD PUBLIC ART GUIDELINES
C: SUPPLEMENTAL FACILITIES
D: CIP COST ANALYSIS
E: CALIFORNIA VEHICLE CODE BICYCLE SECTIONS (21200-21212)

APPENDICES

APPENDIX A

Roadway Segment Suitability Rating Forms

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Adams Street

Suitability Factors	Factor Descriptions and Values	Value	1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use, Class I, II or III		–	–								
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)		25	25								
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		2	2								
Outside Lane Width (W)*	Lane width adequate, marginal or inadequate		11	12								
Pavement Factors (PF)*	Curb and gutter	0 25		✓								
	Patched or weathered paving	0 25										
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50										
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75										
	Total Pavement Factor		0	0 25								
Location Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25	✓									
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50										
	Center turn lane	0 25										
	Median present	0 25										
	Paved shoulder	0 75										
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25	✓									
	High level of off street parking	0 50										
	On street parallel parking	0 50		✓								
	On-street angled parking	0 75										
	On-street truck parking	1 00										
	Little or no adjacent parking	0 25										
	Total Location Factor		0 5	0 5								
	Total Pavement and Location Factors		0 5	0 75								
	Segment Bicycling Suitability**											

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Alga Road

Segments

Suitability Factors	Factor Descriptions and Values		1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use, Class I II or III		2	2								
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)		40	45								
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		4	4								
Outside Lane Width (W)*	Lane width adequate, marginal or inadequate		12	12								
Pavement Factors (PF)*	Curb and gutter	0 25	✓	✓								
	Patched or weathered paving	0 25										
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50										
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75										
	Total Pavement Factor		0 25	0 25								
Location Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25										
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50	✓	✓								
	Center turn lane	0 25										
	Median present	0 25	✓	✓								
	Paved shoulder	0 75										
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25										
	High level of off street parking	0 50										
	On street parallel parking	0 50										
	On street angled parking	0 75										
	On street truck parking	1 00										
	Little or no adjacent parking	0 25	✓	✓								
	Total Location Factor		0	0								
	Total Pavement and Location Factors		0 25	0 25								
	Segment Bicycling Suitability**											

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Alicante Road

Suitability Factors	Factor Descriptions and Values		1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use Class I II or III		—									
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)		35									
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		2									
Outside Lane Width (W)*	Lane width adequate marginal or inadequate		12									
Pavement Factors (PF)*	Curb and gutter	0 25	✓									
	Patched or weathered paving	0 25										
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50										
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75										
	Total Pavement Factor		0 25									
ation Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25										
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50	✓									
	Center turn lane	0 25	✓									
	Median present	0 25										
	Paved shoulder	0 75										
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25										
	High level of off street parking	0 50										
	On street parallel parking	0 50										
	On street angled parking	0 75										
	On street truck parking	1 00										
	Little or no adjacent parking	0 25										
	Total Location Factor		0 25									
	Total Pavement and Location Factors		0 5									
	Segment Bicycling Suitability**											

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Avenida Encinas

Suitability Factors	Factor Descriptions and Values	Value	1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use Class I II or III		2	–		–						
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)			30	35	40						
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		4	2	2	4						
Outside Lane Width (W)*	Lane width adequate, marginal or inadequate		12	10	15	11						
Pavement Factors (PF)*	Curb and gutter	0 25	✓		✓	✓						
	Patched or weathered paving	0 25		✓								
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50										
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75		✓								
	Total Pavement Factor		0 25	1 0	0 25	0 25						
Location Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25										
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50										
	Center turn lane	0 25										
	Median present	0 25	✓			✓						
	Paved shoulder	0 75										
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25										
	High level of off street parking	0 50										
	On street parallel parking	0 50										
	On street angled parking	0 75										
	On street truck parking	1 00										
	Little or no adjacent parking	0 25	✓		✓	✓						
	Total Location Factor		-0,5	0	-0 25	0 5						
	Total Pavement and Location Factors		-025	1 0	0	-025						
	Segment Bicycling Suitability**											

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Batiquitos Drive

Suitability Factors	Factor Descriptions and Values		1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use, Class I, II or III		2	2	–							
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)			25	25							
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		2	2	2							
Outside Lane Width (W)*	Lane width adequate, marginal or inadequate		12	13	12							
Pavement Factors (PF)*	Curb and gutter	0 25	✓	✓								
	Patched or weathered paving	0 25			✓							
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50										
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75										
	Total Pavement Factor		0 25	0 25	0 25							
Location Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25	✓									
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50										
	Center turn lane	0 25	✓									
	Median present	0 25										
	Paved shoulder	0 75										
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25			0 25							
	High level of off street parking	0 50										
	On-street parallel parking	0 50										
	On street angled parking	0 75										
	On street truck parking	1 00										
	Little or no adjacent parking	0 25	✓	✓								
	Total Location Factor		0 25	[illegible]	0 5							
	Total Pavement and Location Factors		0	0	0 5							
	Segment Bicycling Suitability**											

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Camino de los Coches

Segments

Suitability Factors	Factor Descriptions and Values		1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use, Class I II or III		2	2								
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)		40	40								
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		4	2								
Outside Lane Width (W)*	Lane width adequate marginal or inadequate		12	12								
Pavement Factors (PF)*	Curb and gutter	0 25	✓	✓								
	Patched or weathered paving	0 25										
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50										
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75										
	Total Pavement Factor		0 25	0 25								
Location Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25										
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50										
	Center turn lane	0 25	✓	✓								
	Median present	0 25										
	Paved shoulder	0 75										
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25										
	High level of off street parking	0 50										
	On street parallel parking	0 50		✓								
	On street angled parking	0 75										
	On street truck parking	1 00										
	Little or no adjacent parking	0 25	✓									
	Total Location Factor		-0 5	0 25								
	Total Pavement and Location Factors		-0 25	0 5								
	Segment Bicycling Suitability**											

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Camino Vida Roble

Suitability Factors	Factor Descriptions and Values		1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use Class I II or III		2	2								
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)		40	40								
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		2	2								
Outside Lane Width (W)*	Lane width adequate, marginal or inadequate		12	12								
Pavement Factors (PF)*	Curb and gutter	0 25	✓	✓								
	Patched or weathered paving	0 25										
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50										
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75										
	Total Pavement Factor		0 25	0 25								
[Loc]ation Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25										
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50										
	Center turn lane	0 25	✓									
	Median present	0 25		✓								
	Paved shoulder	0 75										
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25	✓	✓								
	High level of off street parking	0 50										
	On street parallel parking	0 50										
	On street angled parking	0 75										
	On street truck parking	1 00										
	Little or no adjacent parking	0 25										
	Total Location Factor		0	0								
	Total Pavement and Location Factors		0 25	0 25								
	Segment Bicycling Suitability**											

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Cannon Road

Suitability Factors	Factor Descriptions and Values		Segments 1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use, Class I II or III		–	2	2							
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)		35	35	35							
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		2	4	4							
Outside Lane Width (W)*	Lane width adequate marginal or inadequate		11	12	12							
Pavement Factors (PF)*	Curb and gutter	0 25	✓	✓	✓							
	Patched or weathered paving	0 25										
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50										
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75										
	Total Pavement Factor		0 25	0 25	0 25							
Location Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25										
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50										
	Center turn lane	0 25			✓							
	Median present	0 25		✓								
	Paved shoulder	0 75										
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25										
	High level of off street parking	0 50										
	On street parallel parking	0 50			✓							
	On street angled parking	0 75										
	On street truck parking	1 00										
	Little or no adjacent parking	0 25	✓	✓								
	Total Location Factor		-0 25	-0 5	0 25							
	Total Pavement and Location Factors		0	0 25	0 5							
	Segment Bicycling Suitability**											

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Carlsbad Blvd

Suitability Factors	Factor Descriptions and Values		1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use Class I II or III		2	2	2	2	2	2				
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)		30	30	30	30	30	45				
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		3	4	4	4	2	4				
Outside Lane Width (W)*	Lane width adequate marginal or inadequate		12	11	12	12	12	12				
Pavement Factors (PF)*	Curb and gutter	0 25		✓	✓	✓		✓				
	Patched or weathered paving	0 25										
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50		✓								
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75										
	Total Pavement Factor		0	0 75	0 25	0 25	0	0 25				
Location Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25										
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50										
	Center turn lane	0 25										
	Median present	0 25				✓						
	Paved shoulder	0 75	✓				✓					
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25		✓	✓	✓		✓				
	High level of off street parking	0 50					✓					
	On street parallel parking	0 50										
	On street angled parking	0 75					✓					
	On street truck parking	1 00										
	Little or no adjacent parking	0 25	✓									
	Total Location Factor		-1 0	0 25	0 25	0	1.5	0 25				
	Total Pavement and Location Factors		0 75	1 0	0 5	0 25	0 5	0.5				
	Segment Bicycling Suitability**											

Changed [illegible] .5 [illegible]

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Carlsbad Village Drive

Suitability Factors	Factor Descriptions and Values		1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use Class I II or III		–	–	–	2	2	–	2			
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)		25	25	35	35	35	40	40			
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		4	4	4	4	4	2	2			
Outside Lane Width (W)*	Lane width adequate marginal or inadequate		11	11	12	12	12	12	12			
Pavement Factors (PF)*	Curb and gutter	0 25	✓	✓	✓	✓	✓	✓	✓			
	Patched or weathered paving	0 25										
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50										
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75										
	Total Pavement Factor		0 25	0 25	0 25	0 [illegible]	0 25	0 25	0 25			
Location Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25				✓	✓					
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50										
	Center turn lane	0 25			✓	✓	✓					
	Median present	0 25	✓	✓								
	Paved shoulder	0 75										
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25										
	High level of off street parking	0 50										
	On street parallel parking	0 50	✓									
	On street angled parking	0 75										
	On street truck parking	1 00										
	Little or no adjacent parking	0 25			✓	✓	✓	✓	✓			
	Total Location Factor		0 25	-0 25	0 5	-0 15	0 25	0 25	-0 25			
	Total Pavement and Location Factors		0 5	0	-0 25	0	0	0	0			
	Segment Bicycling Suitability**											

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Chestnut Avenue

Suitability Factors	Factor Descriptions and Values		1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use Class I II or III		-	2	3	2	2	2				
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)		25	25	25	30	30	25				
Traffic Volume (ADT)*	Average daily trips (ADT)											
Travel Lanes (L)*	Number of travel lanes both ways		2	2	2	2	2	2				
Outside Lane Width (W)*	Lane width adequate, marginal or inadequate		12	12	12	12	12	12				
Pavement Factors (PF)*	Curb and gutter	0 25	✓	✓			✓	✓				
	Patched or weathered paving	0 25										
	Cracked paving	0 50										
	Moderate frequency of curb cuts	0 50										
	Rough RR crossing	0 50										
	High frequency of curb cuts	0 75										
	Drainage grates	0 75										
	Potholes or rough pavement edges	0 75										
	Total Pavement Factor		0 25	0 25	0 25	0 25	0 25	0 25				
Location Factors (LF)*	**Typical Section Factors**											
	Moderate grades	0 25										
	Frequent vert curves (poor sight dist)	0 25										
	Frequent hor curves (poor sight dist)	0 25										
	Uncontrolled right turn lanes	0 25										
	Severe grades	0 50										
	Center turn lane	0 25										
	Median present	0 25										
	Paved shoulder	0 75										
	Roadway and Parking Factors											
	Moderate level of off street parking	0 25										
	High level of off street parking	0 50										
	On street parallel parking	0 50	✓	✓	✓	✓						
	On street angled parking	0 75										
	On street truck parking	1 00										
	Little or no adjacent parking	0 25					✓	✓				
	Total Location Factor		0 5	0 5	0 5	0 5	-0 75	0 25				
	Total Pavement and Location Factors		0 75	0 75	0 75	0 75	0	0				
	Segment Bicycling Suitability**											

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)

Carlsbad Bikeway Master Plan - Roadway Segment Rating Matrix

Street Chinquapin Avenue		Segments									
Suitability Factors	**Factor Descriptions and Values**	1	2	3	4	5	6	7	8	9	10
Existing Bicycle Facilities	Multiple use, Class I, II or III	—									
Posted Speed Limit (S)*	Posted speed limit in miles per hour (mph)	25									
Traffic Volume (ADT)*	Average daily trips (ADT)										
Travel Lanes (L)*	Number of travel lanes both ways	2									
Outside Lane Width (W)*	Lane width adequate marginal or inadequate	12									
Pavement Factors (PF)*	Curb and gutter 0 25	✓									
	Patched or weathered paving 0 25										
	Cracked paving 0 50										
	Moderate frequency of curb cuts 0 50										
	Rough RR crossing 0 50										
	High frequency of curb cuts 0 75										
	Drainage grates 0 75										
	Potholes or rough pavement edges 0 75										
	Total Pavement Factor	0.25									
Location Factors (LF)*	**Typical Section Factors**										
	Moderate grades 0 25										
	Frequent vert curves (poor sight dist) 0 25										
	Frequent hor curves (poor sight dist) 0 25										
	Uncontrolled right turn lanes 0 25										
	Severe grades 0 50										
	Center turn lane 0 25										
	Median present 0 25										
	Paved shoulder 0 75										
	Roadway and Parking Factors										
	Moderate level of off street parking 0 25										
	High level of off street parking 0 50										
	On street parallel parking 0 50	✓									
	On street angled parking 0 75										
	On street truck parking 1 00										
	Little or no adjacent parking 0 25										
	Total Location Factor	0 5									
	Total Pavement and Location Factors	0 75									
	Segment Bicycling Suitability**										

*Bicycle Suitability Rating Formula = ADT/(L x 2500) + S/35 + (14 W) + PF + LF **Excellent = 0 to 4 (Segments that exhibit extremely favorable characteristics for cycling) Good = 4 to 5 (Segments which are conducive to cycling but with some minor drawbacks) Fair = 5 to 6 (Segments of marginal desirability for cycling) Poor = 6 or above (Segments of questionable desirability and generally not recommended for cycling)