

## Chapter 3

# RECOMMENDED *PEDESTRIAN AND BIKEWAY* NETWORK

### INTRODUCTION

This chapter presents the recommended *pedestrian and* bikeway network for the City of Santa Rosa. It first describes the ~~methodology~~ *criteria* used to identify *and rank* the network, ~~including information on the characteristics of bicyclists and the types of cyclists to be served by the plan.~~ The types of bikeways used in the network are *also* ~~then~~ described. Finally, a description of the recommended *pedestrian and* bicycle network is provided. Since this is an update of the ~~1994–2001~~ plan, the focus is on revising previous recommendations where appropriate and, in **Chapter Five, identifying the highest priority projects.** The complete network is comprised of existing *pedestrian and* bikeways and proposed *pedestrian and* bikeways. *Pedestrian improvements are not illustrated, but listed in Chapter 5. However, future updates to the BPMP should consider illustrating these improvements as resources and time become available.* ~~They~~*The bikeways* are illustrated together in Figures ~~6-3-1~~ and ~~7-3-2~~. The following pages provide more detail about the *pedestrian projects and* proposed bikeways and other improvements that will improve *walking and* bicycling conditions in the City of Santa Rosa. More detail is provided in Chapter Five on the **ten *pedestrian and bicycle routes*** that were identified as having the highest priority.

### COMPLETE STREETS

*This update to the Bicycle and Pedestrian Master Plan (BPMP) takes the idea of Complete Streets when planning for the City’s pedestrian and bicycle network. The concept of “Complete Streets” where streets are no longer simply considered and designed for the personal automobile but designed with all users of the road in mind has been discussed in planning and engineering circles for a couple of years, and not until recently has begun to take hold across the nation and here in California. The idea started with bicycle and pedestrian advocates and has attracted a diverse national alliance of other supporters, including advocates for senior citizens and the disabled. Complete Street is a way of rebalancing the public realm away from automobile dominance so that roads are available to all users: pedestrians, bicyclist, transit and the motorist creating “Livable streets.” The City’s General Plan defines “Livable streets” as the “...design and integration of alternative modes.”<sup>1</sup> The need for transportation agencies to change their orientation away from building primarily for cars and consider the “other users of the road” is addressed in policies at the federal, state and regional level. Those polices follow along with Santa Rosa’s own policies and planning documents that help implement “Complete Streets” into its transportation projects.*

<sup>1</sup> Santa Rosa General Plan 2035 Chapter 3, Urban Design p.3-1.

## FEDERAL POLICY DIRECTIVE – US DOT

In February 2000, the United States Department of Transportation (US DOT) issued a “Design Guidance Accommodating Bicycle and Pedestrian Travel: A Recommended Approach in response to the Transportation Equity Act for the 21st Century (TEA-21). It includes four policy directives:

1. Bicycle and pedestrian ways shall be established in new construction and reconstruction projects in all urbanized areas unless one or more of three conditions are met:

- Bicyclists and pedestrians are prohibited by law from using the roadway. In this instance, a greater effort may be necessary to accommodate bicyclists and pedestrians elsewhere within the right of way or within the same transportation corridor.
- The cost of establishing bikeways or walkways would be excessively disproportionate to the need or probable use. Excessively disproportionate is defined as exceeding twenty percent of the cost of the larger transportation project.
- Where sparsity of population or other factors indicate an absence of need.

2. In rural areas, paved shoulders should be included in all new construction and reconstruction projects on roadways used by more than 1,000 vehicles per day. Paved shoulders have safety and operational advantages for all road users in addition to providing a place for bicyclists and pedestrians to operate.

3. Sidewalks, shared use paths, street crossings (including over- and undercrossings), pedestrian signals, signs, street furniture, transit stops and facilities, and all connecting pathways shall be designed, constructed, operated and maintained so that all pedestrians, including people with disabilities, can travel safely and independently.

4. The design and development of the transportation infrastructure shall improve conditions for bicycling and walking through the following additional steps:

- Planning projects for the long-term.
- Addressing the need for bicyclists and pedestrians to cross corridors as well as travel along them.
- Getting exceptions approved at a senior level.
- Designing facilities to the best currently available standards and guidelines.

The US DOT “Design Guidance, Accommodating Bicycle and Pedestrian Travel” appears in Appendix A.

## STATE POLICY DIRECTIVE – CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS)

In March 2001, Caltrans adopted a policy directive accommodating non-motorized travel known as Caltrans Deputy Directive 64 (DD-64) that adopted the best practice concepts in the US DOT Policy Statement on Integrating Bicycling and Walking into Transportation Infrastructure. In 2008, Caltrans revised this policy (DD-64 R1) to address Complete Streets consistent with recent state legislation. DD-64-R1 definition and background section of the policy reads:

**Complete Street**— A transportation facility that is planned, designed, operated, and maintained to provide safe mobility for all users, including bicyclists, pedestrians, transit riders, and motorists appropriate to the function and context of the facility.

The intent of this directive is to ensure that travelers of all ages and abilities can move safely and efficiently along and across a network of "complete streets."

State and federal laws require the Department and local agencies to promote and facilitate increased bicycling and walking. California Vehicle Code (Sections 21200-21212), and Streets and Highways Code (Sections 890 – 894.2) identify the rights of bicyclists and pedestrians and establish legislative intent that people of all ages, using all types of mobility devices are able to travel on roads. Bicyclists, pedestrians, and nonmotorized traffic are permitted on all State facilities, unless prohibited (CVC, section 21960). Therefore, the Department and local agencies have the duty to provide for the safety and mobility needs of all who have legal access to the transportation system.

Department manuals and guidance outline statutory requirements, planning policy, and project delivery procedures to facilitate multimodal travel, which includes connectivity to public transit for bicyclists and pedestrians. In many instances, roads designed to Department standards provide basic access for bicycling and walking. This directive does not supersede existing laws. To ensure successful implementation of "complete streets," manuals, guidance; and training will be update and developed.

Although the Caltrans policy directive is applicable to Caltrans employees, it provides subtle encouragement to local agencies to provide safety and mobility needs for all legal users of the transportation system and consideration of Complete Streets. Caltrans DD-64-R1 "Complete Streets—Integrating the Transportation System" appears in Appendix B.

## STATE LEGISLATION – CALIFORNIA

ACR 211 — After Caltrans issued DD-64 and before revising it (DD-64-R1), California Assembly Concurrent Resolution No. 211 (Chapter 120, Statutes of 2002) by Assemblyman Nation was enacted in August 2002. ACR 211 encouraged local jurisdictions to implement the policies of both the Federal and State Policy Directives in DD-64 when constructing transportation projects. As such, these policy directives are not required. ACR 211 appears in Appendix C.

*AB 1358 — California’s “Complete Street Act” was enacted in September 2008 (Chapter 657, Statutes of 2008; AB 1385—Leno). This legislation requires a legislative body of a city or county, upon revision of its circulation element of the general plan, to modify its circulation element for a balanced, multimodal transportation network beginning January 1, 2011. However, the Governor’s Office of Planning and Research is required to develop guidelines for cities and counties by January 1, 2014 to assist them in meeting the requirements of California’s “Complete Street Act. AB 1385 appears in **Appendix D.***

### **(REGIONAL) METROPOLITAN TRANSPORTATION COMMISSION POLICY DIRECTIVE**

*In xxxx, the Metropolitan Transportation Commission (MTC) issued ... (pending)*

### **SANTA ROSA 2035 GENERAL PLAN, 2009**

*The Santa Rosa General Plan addresses various elements related to physical development, growth management, and transportation services among others, and has a planning horizon through the year 2035. The City’s General Plan is the guiding document from which all other regulatory documents must follow. The General Plan does not contain specific criteria; rather, it establishes goals and objectives for other documents to implement. These implementation documents such as the City’s Zoning Code are therefore more specific with less room for interpretation.*

*The transportation element of the General Plan is located in Chapter Five, which contains two vision statements that discuss bicycle and pedestrian-related design and development: 5-6, Bicycle Facilities; and, 5-7, Pedestrian Facilities. These sections are further defined by several goals and objectives under three categories: T-J, T-K, and T-L.*

### **SANTA ROSA DESIGN GUIDELINES, 2002**

*The City’s Design Guideline to provide a clear set of design policies to project sponsors such as those in the development community, property owners, and public agencies. The Guidelines serve as the primary design criteria city staff, boards and commissions and the City Council use to evaluate project proposals. These guidelines apply to all projects that require design review and public improvements such as streets. Adherence to the guidelines, however, is not meant to stifle design creativity. An applicant/designer may propose an alternate approach to a guideline(s). In that case, it shall be the responsibility of the applicant/designer to demonstrate to City staff, boards and commissions how the proposal creates an equal or higher level of design quality than the guideline(s) would provide.*

*Pedestrian and bicycle design criteria can be found throughout various sections of the City’s Design Guidelines and are not just limited to Street and Public Ways, or Streetscapes sections of the Design Guidelines.*

### **SANTA ROSA STREET DESIGN AND CONSTRUCTION STANDARDS, 2004**

*The City's Street Design and Construction Standards provide the minimum engineering standards for construction of City streets. These are the required standards used for the design and construction of all private and public streets. These standards were revised in 2004 to bring them into conformity with the City's Design Guidelines. Deviations from these standards may be granted by approval of the City Engineer. The standards do not preclude the use of a higher standard. This document is relevant in that it provides the standards for sidewalks, pathway and bike lanes.*

### **SANTA ROSA WATER DESIGN AND CONSTRUCTION STANDARDS, 2002**

*similar to the City's Street Design and Construction Standards the Water Design and Construction Standard provides the standards for the placement of water apparatus such as fire hydrants on or near sidewalks.*

## **METHODOLOGY**

The primary considerations in developing the *evaluating the pedestrian network and bikeway* network were to serve ~~all~~ *most of the existing and potential users, to improve walking and bicycle-bicycling safety and to serve all-key origination and destinations attractors and (traffic generators)* with direct, non-circuitous routes. Opportunities and constraints for route selection were determined via field reviews, analysis of existing ~~bikeway-facility~~ *locations, and other sources such as aerial photographs, collision histories, review of existing planning documents, public input from area bicyclists, and analysis of attractor and generator locations.*

### **Pedestrian Facilities**

*The primary considerations for maintaining the pedestrian network is to serve all users, improve safety, and limit pedestrian barriers to accessing transit, education, shopping, and services. The lack of sidewalks diminishes safe access through the city for all residents, but in particular the elderly, disabled, and youth. Although some areas of Santa Rosa were designed without sidewalks such as some hillside developments, and scenic roads, these scenarios usually are outside the urban area and may provide wide shoulders for pedestrian access.*

*Future updates of the BPMP should include pedestrian facilities maps that depict street alignments that have no sidewalk facilities on either one or both sides of the road and distinguish between those area that by design have no sidewalks. Such a map can also illustrate the presence of existing Class I bicycle facilities—which serve as pedestrian pathways in the primary network, and which were identified as the pedestrian facilities in the 2001 Update.*

*Pedestrian infrastructure provided in the City of Santa Rosa includes sidewalks, multi-use pathways, unpaved pathways, (trails), curb ramps, crosswalks, pedestrian signals, audible crossing cues and amenities, such as warning and information signs, transit shelters, lighting, benches, drinking fountains, shade trees and artwork.*

*Special treatments are provided downtown for pedestrians such as decorative paving, bollards and crosswalk treatments. The existing crosswalks include standard parallel lines, ladder crosswalks, school zone crosswalks, enhanced “zebra” crosswalks, special paving treatments and high visibility treatments with overhead pedestrian activated warning flashers.<sup>2</sup>*



*The City’s design guidelines and standards for sidewalks are provided in the Santa Rosa Design Guidelines (2002) and the Santa Rosa Street Design and Construction Standards (2004). Recommendations for improving the pedestrian experience as a valuable form of transportation are provided in the **Best Practices and Design Guidelines Section**.*

## **BICYCLE FACILITIES**

### **Types of Bicyclists**

The primary objective of the citywide bikeway network is to serve the needs of all types of bicyclists. There are many types of bicyclists with varying levels of skill and willingness to ride in traffic. These range from the experienced adult cyclist to the casual adult cyclist to the child cyclist. There are many gradations of cycling competency and confidence, and just as many opinions as to what makes an ideal bike route. For example, some experienced cyclists avoid separate bike paths, preferring to share the roads with cars. Other cyclists will ride in bike lanes only if parallel residential roads are unavailable.

Children also have special needs. Children approximately ten years and older are capable of walking or riding a bike by themselves for more than a few blocks. Parents are most likely to allow their children to ride only on residential streets, and to cross arterial intersections when controlled by traffic signals. As their children get older, many parents will allow them to ride on busier streets with bike lanes.

~~The preferences for bikeway facilities of the various bicyclists are presented in Table 3-1. While it is not meant to imply that all bicyclists fit exactly into one of these five categories, this table illustrates the varied preferences that exist across the spectrum of cyclists. In order to serve all~~

<sup>2</sup> From MIG’s October 2008 Draft, Ch.2 Existing Conditions, “Pedestrian Facilities” p.35.

**Figure 3.16**

**Figure 7-3.2**

**Table 3-1  
BICYCLIST USER TYPES VERSUS FACILITY TYPES**

		<b>Experienced</b>	<b>Casual Adult</b>	<b>Novice Adult/ Youth</b>	<b>Experienced Recreational</b>	<b>Family Recreational</b>
<b>Roadways</b>						
No Bike Lanes	Bicycle Boulevard or <2000 VPD	3	3	3	3	3
	≤ 13' curb lane	3			3(low ADT)	
	14' curb lane	3	3		3	
	15' + curb lane	3	3		3	
Minimum Bike Lane Width of four feet	Low ADT	3	3	3	3	
	Med. ADT	3	3		3	
	High ADT	3			3	
Optimal Bike Lane Width of five feet or more	Low ADT	3	3	3	3	3
	Med/High ADT	3	3	3	3	
<b>Bike Paths</b>						
8 feet wide—Low to High ped volumes			3	3		3
12 feet wide—High Ped. Volumes			3	3		3
12 feet wide—Low Ped. Volumes		3	3	3	3	3
VPD = Vehicles Per Day ADT = Average Daily Traffic Note: This table illustrates how various facility designs serve the various types of bicyclists; for the purposes of this table, bicyclists have been categorized into five general types, but this does not imply that all bicyclists would have the same preferences as one of these categories.						

types of bicyclists, the bikeway network consists of major roads in Santa Rosa, some residential streets and multi-use paths.

*Besides the three standard bicycle facility roadway classifications discussed below, bicycle facilities include Bicycle Parking, Bicycle Detection, Multi-Modal Transit Access, and Private Showering/Changing Facilities. Other street treatments such as Bicycle Boulevards and Shared Roadway Bicycle Markings are discussed in the **Best Practices and Design Guidelines Section** and **Bicycle Parking Section**.*

### **Transportation versus Recreation**

The bikeways of the Santa Rosa Bicycle Master Plan Update do not distinguish between routes used primarily for transportation or recreation. Many routes, which at first appear to be primarily recreational, are indeed used for commuting or other transportation purposes, and vice-versa. Just as roadways are built and maintained for motorists without regard to trip purpose, all the recommended routes described in this plan should be considered important regardless of whether primarily used for transportation or recreation. It is acknowledged that some routes may be more often used for transportation than recreation or vice versa. This is accounted for in the prioritization criteria by the extra consideration given to projects that serve the downtown. It is also acknowledged that some funding sources are exclusively for transportation bicycle facilities.

The multi-use trails included in this Plan provide a completely separate right of way for the exclusive use of bicyclists and pedestrians. Bicyclists in many cases would need to travel at reduced speeds to avoid colliding with walkers, joggers, and those on roller-blades, but may find that these trails provide improved commuting access to places of employment, and an enjoyable source of family-oriented recreational activity.

### **BIKEWAY CLASSIFICATIONS**

Chapter 1000 of the *California Department of Transportation (Caltrans) Highway Design Manual (HDM)* describes three types of bicycle facilities (*Bikeways*). The HDM definition is presented in Italics. (**NOTE:** *At the time this BPMP was being updated, Caltrans was revising the HDM. The design standards for bicycle facilities may have moved from the current Chapter 1000 and additional design criteria and/or standards may have been added. Consult the latest version of the HDM for the latest information. Future versions of the BPMP should include these HDM revisions.*). For reference the existing HDM Chapter 1000 is included in **Appendix E**.

#### **Class I Bike Path.**

*Provides a completely separated right of way for the exclusive use of bicycles and pedestrians with cross-flow minimized.*

Bike paths are an important component of every bikeway network. Some are long enough and well-located enough to provide a car-free environment for a large portion of a bicycling trip. Other bike paths are used to close gaps in a route such as connecting two dead-end roads or traversing parks.

Bike paths are popular with casual bicyclists and families with children, and they can be popular with experienced bicyclists if well-designed and located conveniently to their route. However, their popularity with slow cyclists including families with children and non-bicyclists such as joggers, roller bladers, parents with baby strollers, people walking their dogs, etc., limits the usefulness of a bike path *as a “transportation facility”* to cyclists who ride 10 to 15 mph or faster *and use the facility as a primary commuter route*. Serious bicyclists can rarely ride as fast on a bike path as they can on city roads. This is due both to the design of the bike path and to the high numbers of slower users. *For this reason, Class I designations are proposed in key City parks so that future improvements can be made to these corridors to improve them as transportation facilities for bicyclist while serving the needs of other users (See Figure 3-1 and the Bike Project lists—Tables 3-1 and 3-2).*

Bike paths should be designed in accordance with accepted design guidelines to account for all the other users. The width of the bike path should be increased depending on the numbers and stratification of the users.

## 2. Class II Bike Lane.

*Provides a striped lane for one-way bike travel on a street or highway.*

The bike lane is for the exclusive use of bicycles with certain exceptions: for instance, right-turning vehicles must merge into the lane prior to turning, and pedestrians are allowed to use the bike lane when there is no adjacent sidewalk [\(CVC 21966\)](#).

Bike lanes should be used when traffic volumes exceed a certain threshold, e.g., 4,000 vehicles per day. Below this traffic volume, there should be adequate gaps in oncoming traffic for motor vehicles to safely pass bicyclists.

The Highway Design Manual specifies the minimum width for bike lanes under three conditions:

1. Next to a curb - on-street parking allowed: minimum width is five feet where there is a vertical curb and the parking stalls are marked (or a continuous parking stripe is present). Where parking and/or turnover is infrequent and no parking stalls are marked, twelve feet is the minimum. With rolled curbs, the bike/parking lane may be eleven feet.
2. Next to a curb - on-street parking prohibited: minimum width is ~~four~~ *five* feet with the proviso that there is at least 36 inches to the longitudinal joint where the asphalt meets the gutter pan. With a 24 inch gutter, the minimum bike lane width is five feet.
3. On roadways without curb and gutter - where infrequent parking is handled off the pavement: minimum width is four feet.

It also states that, “for greater safety,” widths wider than the minimums should be provided “wherever possible.” *Criteria for use of wider bike lanes are discussed in the **Best Practices and Design Guidelines Section**. Class II-Bike Lanes are not recommended on local streets, as defined in the Street Design and Construction Standards, and would be counter productive on a local street as noted in the City’s Design Guidelines.*<sup>3</sup>

<sup>3</sup> Santa Rosa Design Guidelines 2002, I.I Neighborhood Design, “II. Guidelines, B. Block and Street Pattern” p.I.1-5

### 3. Class III Route.

*Provides for shared use with pedestrian or motor vehicle traffic.*

*Class III bike routes are intended to provide continuity to the bikeway system and serve two purposes: 1) to establish through routes that are not served by Class I or II, or 2) to connect discontinuous segments of bikeway (normally bike lanes). The HDM also states that on-street Bike Routes should offer a higher degree of service than alternative streets, and provides six criteria for defining that higher degree of service. In the recently revised edition of the American Association of State Highway and Transportation Officials' (AASHTO) Guide for the Development of Bicycle Facilities, 1999, Class III is called a Designated Shared Roadway rather than a Bike Route. Although the HDM does not present the minimum widths for Class III bikeway, as the acceptable width is dependent on many factors, the AASHTO Guide suggests a preferred width of 12 feet with 14 feet as generally recommended width for shared use in a wide curb lane.<sup>4</sup> Class III has traditionally been used to designate anything from low volume residential roads that have no need for bike lanes to arterials with heavy traffic volumes where widening to provide bike lanes would be infeasible.*

*This plan recommends Class III for low volume or residential streets where bike lanes are not needed because traffic volumes are low and speeds are slow, and most often prohibitive because of the limited Right-of-Way, or to connect discontinuous segments (gaps) of the bike network. As noted above, the Best Practices and Design Guidelines Section discusses scenarios for added street treatments where streets widths may be less than desirable for a Class III Bike Route, but still preferred because it provides through and direct travel in bicycle demand corridors.*

~~**Bicycle Boulevards:** Two of the bike routes are recommended to be bicycle boulevards; i.e. residential streets that form a continuous route across a good portion of the City. Bicycle boulevards make excellent routes for adults of all abilities and children as well. The City of Palo Alto pioneered the concept of a Bicycle Boulevard in 1982 when Bryant Street was redesigned to have low traffic and few STOP signs which helps bicyclists maintain travel speeds and reduce trip delay. A bicycle boulevard is now considered to be a low volume street that has few STOP signs along the bike route and traffic control at arterial intersections to help bicyclists cross. Some traffic calming may be needed in order to discourage motor vehicle traffic from diverting to the Bicycle Boulevard. No other physical improvements are needed besides route signing. The biggest changes are usually signals at arterials, the removal of unwarranted STOP signs, and traffic calming to replace the STOP signs, if necessary. To implement them, communities such as Palo Alto and Berkeley involved the neighborhoods to create bicycle boulevards, livable streets and traffic management plans simultaneously.~~

~~It should be stated that, in some instances in the past, all way STOP controls have been used to appease community concerns regarding motorists driving above the posted speed limit. STOP signs add significantly to the travel time of bicyclists, and have been demonstrated to be~~

<sup>4</sup> American Association of State Highway and Transportation Officials' "Guide for the Development of Bicycle Facilities, 1999," p. 17

~~ineffective in slowing traffic speed between stops. This strategy should not be used on designated bike routes. (to **Best Practices and Design Guidelines Section**)~~

## BIKEWAY CLASSIFICATIONS IN THE SANTA ROSA BICYCLE TRANSPORTATION PLAN

The following categories are used to describe the bikeway network for the City of Santa Rosa.

- Class I-Bike Path - Paved section
- Class II - Bike Lanes
- Class III A Shared Roadway-- Signed Route
- ~~Class III B Bicycle Boulevard Signed Route primarily on residential streets.~~

### PEDESTRIAN AND BIKEWAY RECOMMENDATIONS

The following tables describe the recommended bikeway network for the City of Santa Rosa. *Since the Pedestrian Network is more established than the Bicycle Network, and because sidewalks are generally a requirement of new development, existing areas in need of sidewalk facilities is provided in Chapter 5 along with the prioritized bikeway.*

The existing and proposed bikeway class is given along with its location and limits *in the Bicycle Project lists: Tables 3-1 and 3-2.* Table 3-2-1 presents the on-street network (*Class II and III*) in two parts North-South and West-East directions of travel and *as does* Table 3-3-2 presents the bike path network (*Class I*). ~~(These tables are located at the end of this chapter). If the project(s) have been programmed and funded, it is so indicated. If not funded, the routes were prioritized using the criteria described in Chapter 5.~~

### Philosophy

For planning purposes, bike lanes have been recommended on all arterials. Ideally, every ~~arterial~~ *regional* street would contain bike lanes so that bicyclists can have the same circulation options and mobility as drivers of motor vehicles. High volume ~~collectors~~ *transitional streets, with sufficient right-of-way*, would also ideally have bike lanes, although most ~~collectors~~ *transitional streets* in Santa Rosa are local ~~collectors~~ *transitional streets (transitional streets designed to local standards)* that serve smaller areas and generally have lower traffic volumes. Practically speaking, however, it is acknowledged that bike lanes will be difficult to implement in many places. *These difficult areas are identified in the Bicycle Project lists (Tables 3-1 and 3-2) that require further study and evaluation prior to implementation, or that are subject to another jurisdiction's authority. It is important that the planning map (Figure 3-1 and 3-2) be reviewed in the context of the Bicycle Project lists at the end of this Chapter.* ~~They~~ *These difficult to implement bikeways* are nevertheless included in the Master Plan so that unforeseen future opportunities to provide bike lanes are not missed. If the Master Plan does not indicate that bike

lanes are the preferred ultimate treatment for these streets, then they will never happen. The feasibility of providing bike lanes was assessed for the ten high priority projects presented in Chapter 5. Implementation options for the remaining bike lanes will be considered in future plan updates or at that point in time when opportunities arise.

The Master Plan also includes several Class 3 Bike Routes. Since the local street system of the City of Santa Rosa is not based on a grid system, it is difficult to rely on Class 3 for much through travel. *Santa Rosa is unique in its bicycle network in that its network is not defined by any one bikeway classification. Unlike Portland with its more grid streets lending more to signed bike routes or Boulder, Colorado with its extensive bicycle paths, Santa Rosa's network works best for its topography as a combination of all three classification types: Class I, II and III. Together all three make up Santa Rosa's unique network.* Nevertheless, bike routes do provide needed connections in several locations *as noted above in the HDM. Future updates to the BPMP should consider reviewing the Class III network as necessary for additional complements to the existing bicycle network.* ~~Two streets, Humboldt and Jennings, provide significant benefit in terms of length and access to major attractors, so they are recommended as bike boulevards.~~

### **Restriping of 4-Lane Roads (Road Diets)**

*The 2001 BPMP suggested that a* A number of streets within Santa Rosa which could benefit from bicycle lanes have four vehicle travel lanes with no center turn lanes – the typical four-lane undivided cross-section. *It noted that Many-many* of these corridors also include parking on one or both sides of the street *and: Fewfew*, if any, of these types of streets have adequate right of way for 4-5 foot bicycle lanes without removing either parking or vehicle travel lanes. Two such streets, Summerfield Road and Hoen Avenue, *that were recently* approved by City of Santa Rosa Council *back then have been, or near completion,* ~~to be~~ restriped to three lanes, one lane in each direction with a center left-turn lane and bike lanes. *In addition, Calistoga Road was a former four-lane street that now has three lanes, center turn lane and bike lanes. Segments of Sonoma Avenue from Santa Rosa Avenue east to Farmers Lane are programmed to be restriped to the same Road Diet configuration.*

Though it might seem counterintuitive to reduce the number of vehicle travel lanes in order to regain space for a center turn lane and bicycle lanes, research<sup>5</sup> has indicated that this type of configuration actually increases safety for all road users with minimal impacts to capacity. The main reasons why “four to three lane” conversions improve safety are slower travel speeds, left turn pockets, pedestrian crossings and the provision of bike lanes.

**Left-turn Pockets:** This type of configuration also leads to increased safety because of the availability of “refuges” for left-turning vehicles. When left turn lanes are not provided, there tends to be a high occurrence of rear-end and sideswipe automobile collisions, caused by vehicles waiting in travel lanes to turn left. If the corridor includes numerous driveways and access points, it may be appropriate to include a two-way left-turn lane (2WLTL) in the center of the street. If most left turn activity occurs at intersections or a few major driveways, a more

<sup>5</sup> See Appendix D for a list of references on this subject.

appealing configuration would include a landscaped median in the center of the street with left turn pockets provided only at key locations.

**Travel Speeds:** Travel speeds tend to be lower on streets with two lanes versus four lanes. The appearance of a wide, unimpeded travelway tends to encourage motorists to drive at higher speeds, often overtaking slower drivers in the other lane. On two-lane roads with on-street parking, motorists tend to drive at more cautious speeds. Cautious drivers in essence set the predominant speed, since passing is not possible. Lower vehicle speeds and the presence of fewer vehicles exceeding the speed limit lead to increased safety not only for drivers, but also for pedestrians attempting to cross the street and bicyclists riding in traffic.

**Pedestrian crossings:** Another safety advantage is when pedestrians and bicyclists cross the street. When crossing a typical four-lane undivided street, pedestrians and bicyclists are exposed to four lanes of moving traffic. The double threat – where the motorist in the outside lane stops for the pedestrian but the motorist in the inside lane does not - is unfortunately a common cause of pedestrian accidents. With a three-lane configuration, pedestrians and bicyclists are exposed to only one direction of traffic at a time plus they can use the turning lane as a refuge. Secondly, crossing distances are reduced so that pedestrians and bicyclists are exposed to traffic for less of their crossing time. Finally, pedestrian safety is also enhanced because of the bicycle lane “buffer,” which creates additional space between the sidewalk and travel lanes, particularly on streets that do not have on-street parking.

**Bicycle Lanes:** ~~The ability to provide bike lanes results in improved safety for bicyclists; they are able to ride further from traffic and are less likely to veer into the path of a vehicle behind them when avoiding road obstacles. Also, on streets with parking, they are able to ride further from the door zone.~~ *Although some feel that bicycle lanes are safer, this is relative to the users of the road. “Safety issues about bike lanes depend heavily on where and how they are installed, and how bicyclists use them.”<sup>6</sup> As emphasized in the HDM “the designation of bikeways as Class I, II and III should not be construed as a hierarchy of bikeways; that one is better than the other. Each class of bikeway has its appropriate application.”*

## PEDESTRIANS ON MULTI-USE PATHS

~~The pedestrian element of the Santa Rosa Bicycle Plan Update is limited to the pedestrian’s use of multi-use paths. Most of these~~ *Class I Bike Paths are sometimes referred to as multi-use paths because they are used by pedestrians and bicyclist and in some instances equestrians.* ~~are part of the e~~ Existing and future-proposed Class I trails *pathways are* identified in the bicycle element ~~portion of the plan~~ *Bicycle Project Lists (Tables 3-2)* and are depicted in Figures 3-16 and 73-2. Examples of multi-use paths include the Prince Memorial Greenway, the Brush Creek Trail *Pathway*, the Santa Rosa Creek Trail *Pathway* and the Joe Roddata Trail and west county regional trails

<sup>6</sup> John S. Allen, (Bicycling *Street Smarts Riding Confidently, Legally and Safely*, Author), comment on apbp list server regarding “Cycle lanes encourage motorists to drive closer to bikes...” September 15, 2009

Critical pedestrian issues with multi-use trails and paths are providing connections to activity centers and neighborhoods and the proximity of pedestrian crossing facilities to the trail access point. In terms of pedestrian activity, the most important trail is the Prince Memorial Greenway, since it has the potential for attracting the most significant volume of pedestrians in the downtown area and provides another connection to the Railroad Square district.

~~Pedestrian crossing issues on Santa Rosa Avenue at the entrance to the Prince Greenway trail should be addressed to ensure that pedestrian movement is channelized through the adjacent intersection where there are existing pedestrian crossing facilities. Pedestrian crossing issues also exist at Dutton Avenue and West Third Street where the Rotada Trail crosses the arterials midblock. Further evaluation is required to determine the most appropriate crossing treatment.~~

Where there are multi-use trails which terminate on an arterial mid-block between signalized intersections, a mid-block crossing treatment may be required if there is a need for pedestrians to cross at the location. Potential mitigation measures may include the addition of a median refuge and crosswalk, warning signs and flashers, such as the overhead flashing pedestrian warning sign that the City of Santa Rosa has used at other mid-block locations.

With new development along any multi-use trail, the City of Santa Rosa should look for opportunities to provide direct access to the ~~trail~~ *pathway* from neighborhoods, schools and commercial districts *as noted in the City's 2002 Design Guidelines, Section 1-2 Street and Public Ways, II Street Categories & Types, "Trails."* *It is important to consult the Citywide Creek Master Plan for any proposed pathways on specific flood control channels.*

*It is important to note that creek systems within the City limits are under the jurisdiction of the Sonoma County Water Agency (SCWA). Adjoining land may be owned by the SCWA, the City or privately held. (Add CCMP Hierarchy of use, note to consult the CCMP and appropriate staff)*

## **EXISTING DESIGN GUIDELINES OF THE CITY OF SANTA ROSA**

The City of Santa Rosa's 1994 Bicycle Master Plan specifies design guidelines that elaborate on the Caltrans Highway Design Manual. The design guidelines encompass bikeway, facility, and maintenance specifications. The 1994 Master Plan also included in its appendix the City's Urban Design Policies. The following paragraphs summarize the existing guidelines:

### **Bikeway Guidelines**

For bike lanes, the City's guidelines recommend widths of 13 feet with unstriped curb parking and 5 feet where parking is prohibited. Where possible, four-foot pockets are installed at intersections between the right-turn-only lane and the through lane.

To accommodate bike lanes on existing streets, center-turning lanes may be removed or narrowed. Where bicycle traffic exceeds 300 bicycles per hour and where parking removal does not have an adverse impact on landowners, parking lanes may be converted to commute-hour bike lanes. When bicycle lanes start to exceed 500 bicycles per hour, a dedicated travel lane (8-foot) minimum is recommended.

For the Class I widths, the City defers to the Caltrans Highway Design Manual which is minimum 8 feet width plus 2 foot graded shoulders. The Urban Design guidelines also specify that the pedestrian, bike, and equestrian trails be incorporated into creek corridors where possible to ensure that corridor networks are multi-functional.

### Facilities

*Detectors:* Install signal detectors at major signalized intersections unless a pre-timed signal is already in effect. Detectors should be installed so as to be triggered by bicycles, while a stencil should identify the location of the trigger.

Additional guidelines include the following recommendations in the 1994 Bicycle Plan:

- Santa Rosa's guidelines recommend that lighting fixtures be designed to minimize glare into adjacent properties and placed no higher than 12 feet. Lighting should be provided at all at-grade crossings to illuminate access points.

### Maintenance

Street sweeping occurs once a month except for Class I paths, which are swept when necessary.

## RECOMMENDED DESIGN GUIDELINES

The following practices are recommended to develop and maintain the most useful and convenient bikeway network possible.

### Pavement Marking Materials

**Issue and Analysis** Paint is typically used in Santa Rosa for the bike lane pavement markings and bike lanes stripes. The drawback of paint is that it does not last long and has to be reapplied every one to two years. Certain types of striping, even paint, can be slippery to bicyclists when wet.

The old formula for thermoplastic used in the 1970's was particularly slippery and thick, which is why an earlier version of the Highway Design Manual prohibited the use of thermoplastic as a bike lane striping material. However, modern compositions are not as slippery and now thermoplastic is an acceptable bike lane marking material. Thermoplastic is even better when the composition has been modified with crushed glass (as described below) to increase the coefficient of friction and when the maximum thickness is 100 mils (2.5 mm).<sup>7</sup>

The least slippery (and most long-lasting) pavement marking is permanent pavement marking tape such as 3M Stamark™ tape Series 380I and Series 420. Tape is cost-effective when placed after resurfacing, since it lasts as long as (or longer than) the pavement itself<sup>2</sup>. The use of pavement marking tape for bike lane lines and legends where possible is preferable to thermoplastic (although thermoplastic is acceptable) for the following reasons:

<sup>7</sup> Historical footnote: the 1990 Highway Design Manual recommended against the use of thermoplastic because it was slippery, often with coefficients of friction of 0.20 or less, and very thick. The current HDM does not contain this warning because modern applications of thermoplastic are now acceptable.

<sup>2</sup> The skid resistance of 3M Stamark™ Series 420 tape is 55 BPN<sup>8</sup> with a retained value of 45 BPN; the equivalent coefficient of friction is not available

- it is less slippery
- it is much thinner
- it requires less maintenance
- it lasts longer than thermoplastic and paint.

### Recommendations

1. A non-skid surface should be employed on all traffic lane lines.
2. It is recommended that thermoplastic be used to replace paint when the paint wears away. The recommended formula is shown below.
3. It is recommended that pavement marking tape be used in lieu of painting or thermoplastic after roadway resurfacing work.

Thermoplastic composition: Crushed glass shall be incorporated into the thermoplastic material at a rate of 9 – 10 percent by weight of the combined material. The crushed glass will be used as a substitute for an equal amount by weight of the filler material. Glass beads meeting standard requirements shall be incorporated into the thermoplastic composition at a rate of between 28-30% by weight of the combined material. Thermoplastic composition shall be as follows:

Pigment	25%
Glass Beads	30 %
Filler	35%
Crushed Glass*	10%

*\*The crushed glass shall be produced from cullet of clear glass, with a maximum size of 850 micrometers (100% passing by weight) and a minimum size of 425 micrometers (0-2 % passing by weight).*

Source: Vermont Department of Transportation

### Loop Detectors

**Issue and Analysis** - Actuated traffic signals pose a significant barrier to bicyclists when the detectors do not sense the presence of the bicycle. Bicyclists are then forced to dismount and push the pedestrian button (if there is one) or to proceed against a red light.

Most of the loop detectors currently in place in the City of Santa Rosa are Caltrans Standard 6 by 6. In recent years a number of diagonal wearing pattern detectors were put in place. However, for better detection and longer pavement life, the City has decided to replace loop detectors with video detection at all locations as needed. Video detection has been used successfully in many cities to detect both motorists and bicyclists and eliminates the errors and missed detections of non-ferrous bicycles.

### Recommendations

1. Video detection should be used in place of loop detectors; priority should be given to locations with documented problems detecting bicycles.
2. Certain loop detector types are more sensitive to bicyclists than others, and different detector designs are sensitive in different areas. When loop detectors are used, the sensitivity of the loop detectors should be adjusted to detect most bicycle types. The use and placement of the various types of loop detectors should be in accordance with the *Traffic Signal Bicycle Detection Study*, prepared for the City of San Diego, November 1985. These are summarized below:
  - a) Through lanes shared with bikes: Type D - modified quadropole loops.
  - b) Left-turn lanes/minor side streets: State Type 5DA loop.

- c) Advance detectors that are not expected to be shared by bicycles can be Type A.
  - d) Bike lanes: Type Q - quadropole loops.
3. The location of the sensitive portion of the loop detector should be indicated by use of the standard pavement marking - Standard Plan A24C. This marking should be placed in all left-turn lanes and in the right-most through lane.

### **Maintenance of Surfaces**

The City should adopt patching and compaction standards for all roadways to ensure that road repairs do not result in surfaces that impede bicycle travel. Sample standards from other communities are presented in Appendix E. Recommended maintenance schedules for bike lanes and trails are presented in Table 3-4.

### **Bike Lanes**

Cities and counties are usually responsible for maintaining vegetation along their roadways, particularly when the shrubbery in question is within the city right-of-way. In the cases where shrubbery on private property grows onto city right-of-way and blocks bike lanes, shoulders or the edge of the roadway, the city should notify the property owner to rectify the situation within a limited amount of time, e.g. three weeks, or be financially responsible for the cost of City crews to take care of it.

### **Maintenance of Trails**

Trail rights-of-way are under the jurisdiction of specific agencies or districts, and those entities are responsible for the trail's maintenance. Maintenance needs include drainage, vegetation, clearing, signing, surfacing, graffiti removal, and repair of structures, gates, fences, and barriers. In some cases, the responsibility of maintaining a trail can be contracted out to an agency such as the Regional Parks District.

Respond to hazardous pavement failure reports	Respond to 100% of reports within 8 hours of report
Maintain clean walkways/roadside areas	80% of areas maintained to a “satisfactory” level as defined by a photographic standard
Sweep roadways	100% of roadways every two weeks, with 90% maintained to a “satisfactory” level as defined by a photographic standard
Maintain arterial street traffic markings	100% of markings annually
Maintain non-arterial street traffic markings	75% of markings every two years
Repair deteriorated non-traffic control signs	100% within 30 days of report/complaint
Trim landscaping that encroaches onto roadway or that obscures sight distance	100% within 24 hours of report.
Sweep during construction	Daily

### **Bollards/ Gates as Bike Path Entry Restrictions**

**Issue and Analysis** - Multi-use trails often need some form of signing, curbing, or in some cases a physical barrier at highway intersections to discourage and/or prevent unauthorized motor vehicles from using the facilities. Posts or bollards are undesirable as a motor vehicle deterrent and should only be used as a last resort.

#### **Recommendations**

There are several design alternatives to bollards; one or more of these should be tried before bollards are installed:

- Curbing with tight radii leading up to the roadway can often prevent motorists from attempting to enter the path.
- Split the entryway into one 5-foot (1.5 m) entrance and one 5-foot (1.5 m) exit separated by low landscaping. Operators of emergency vehicles know they can still enter if necessary by straddling the landscaping.
- Bicycle Symbol and Pedestrian Symbol pavement legends at each entrance to the trail to reinforce the non-motorized nature of the trail.

If the motorized prohibition is routinely violated and bollards are necessary at problem locations, they should conform to the standards as shown in Appendix E.