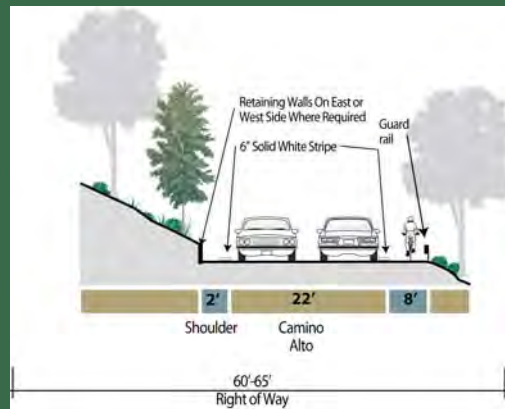


Administrative Draft for the Mill Valley to Corte Madera Bicycle and Pedestrian Corridor Study

Prepared For:
Marin County Department of Public Works



December 2009

Prepared By:
Alta/LandPeople

In Partnership With:
Jacobs Associates, Nolte Associates, LSA Associates, Parisi Associates



Mill Valley-Corte Madera Bicycle and Pedestrian Corridor Study

Prepared for:

Marin County Department of Public Works

Prepared by:



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Acknowledgements

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1 Introduction

Marin County commissioned Alta/LandPeople to conduct a corridor study of three specific bicycle/pedestrian routes connecting the cities of Mill Valley and Corte Madera (the Study). The scope of the Study is to facilitate planning and public participation and conduct preliminary engineering and design work to identify the relative feasibility of each route. The Study process does not include any commitments to proceed – this would occur later through separate processes. The Study is intended to provide useful information for future discussions and decisions.

The connection between Mill Valley and Corte Madera is a key portion of a 70-mile north-south bicycle and pedestrian route corridor serving the most densely populated area of Marin County and connecting Southern and Central Marin (see Figure 1-1). This system will connect to the future SMART rail corridor path system in Larkspur and extend north to Cloverdale in Sonoma County, providing a non-motorized connection from Cloverdale to San Francisco. The routes being studied would connect to the two most highly used bicycle and pedestrian routes in Marin County: the Sandra Marker Trail to the north and the Mill Valley to Sausalito Path to the south. According to the 2008 *Marin County Unincorporated Area Bicycle and Pedestrian Master Plan*, this connection is one of the top priority projects in the county.

1.1 Study Team

Senior Transportation Planner Carey Lando led the project for Marin County Public Works Department. The Study consultant team consisted of the following firms and roles:

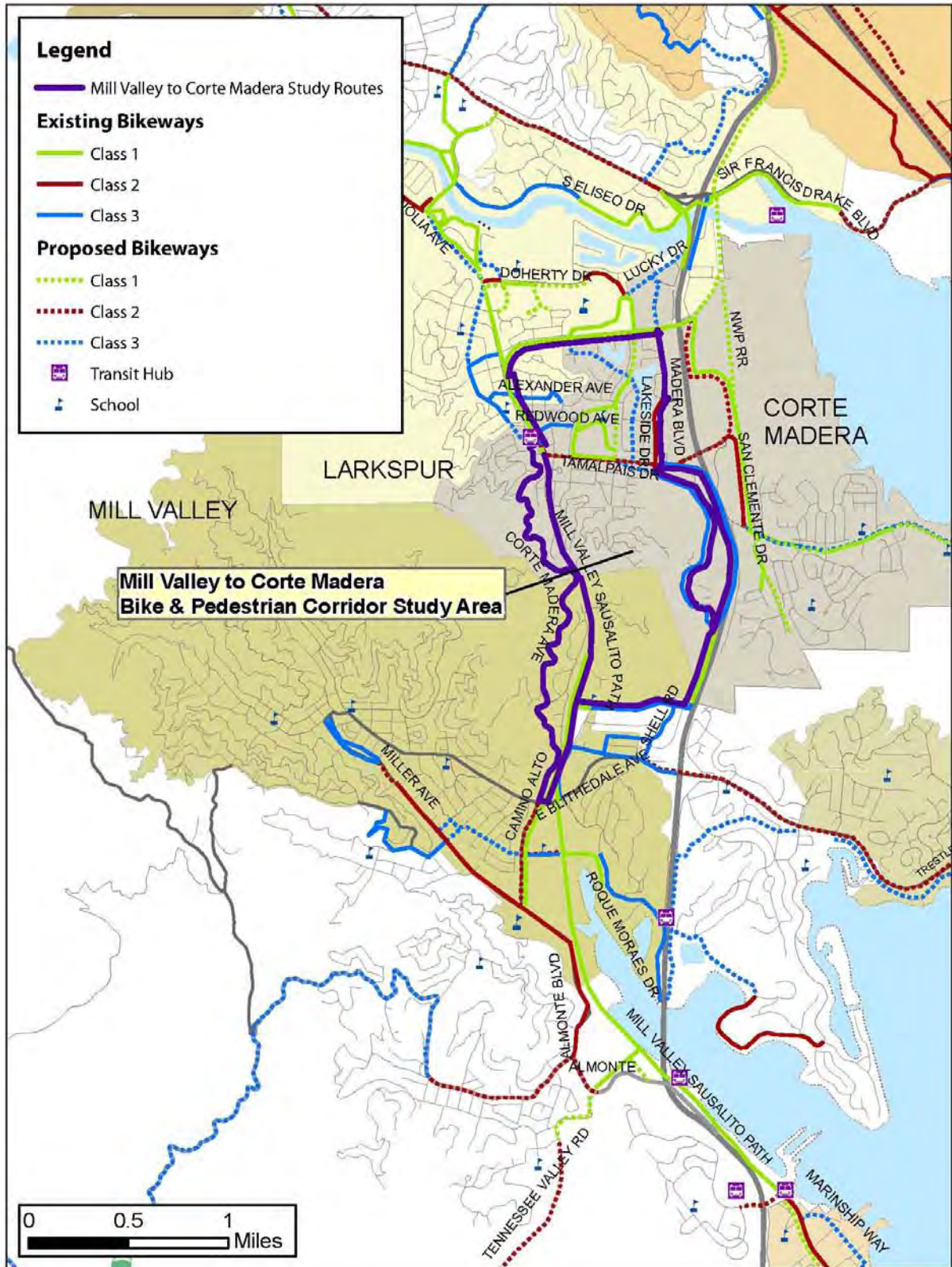
- Alta/LandPeople, Bicycle and Pedestrian Planning, Lead Consultants;
- Jacobs Associates, Tunnel Engineering Feasibility, Geology;
- LSA Associates, Environmental Studies;
- Nolte Associates, Drainage Analysis, Cost Input; and
- Parisi Associates, Traffic Engineering.

A Technical Advisory Committee composed of local agency staff responsible for transportation planning and improvements met at key intervals in the development of the Study to advise on methodology, options, and to review preliminary products:

- Jill Barnes, Senior Engineer, City of Mill Valley
- Dan Dawson, Principal Transportation Planner, Marin County Public Works Dept.
- Ed Hulme, Superintendent, Marin County Parks and Open Space Dept.
- Debra Sue Johnson, Public Works Manager, Town Of Corte Madera
- Bill Whitney, Associate Project Delivery Manager, Transportation Authority of Marin
- Caltrans District 4 Representative

Notes from these meetings are included in Appendix J of the Study.

Figure 1-1: Regional Routes Context



1.2 Study Process

The first phase of the Study consisted of review of background documents, site reconnaissance and research of technical issues. This resulted in the preparation of a series of technical studies or analyses on subjects pertinent to the use and improvement of the three routes.

The second phase consisted of a public participation program included public notice to known interest groups, and information posted on the County's Walk Bike Marin website and at key points along the existing paths in the Study corridor.

An initial public workshop, held March 4, 2009, was attended by approximately 170 persons. The workshop included a presentation by County staff and the consultant team of the study objectives and process and existing conditions along the route. This workshop provided an opportunity for public comments and questions regarding the Study. The public had the opportunity to provide comments during a follow-up period of approximately one month. Workshop and follow-up comments were carefully considered in preparation of this Study. They are summarized in Appendix J of the Study.

The third phase consisted of preparation and refinement of conceptual improvement plans, descriptions, and estimates. This was based on study of existing conditions along the routes, input from the public and the Technical Advisory Committee, and analyses of significant technical issues. The Study team collaborated to describe specific improvements that could be made along the routes to better accommodate bicyclists and pedestrians, including people with disabilities, and address issues identified in the prior phases. The resulting conceptual improvement projects were evaluated to compare their performance against criteria that reflected the issues of concern. Construction and ongoing maintenance costs and steps to implement the projects were identified at a general level, consistent with a planning-level study.

The fourth and final phase of the Study is public review of the draft products, and revision in response to comments.

1.3 Executive Summary

The Study addresses three routes: Route A - the Horse Hill/Casa Buena Route, Route B - the Alto Tunnel route, and Route C - the Camino Alto/Corte Madera Avenue route (see Figure 1-2). The limits of all three alternatives were the same – the Mill Valley-Sausalito Multi-Use Path intersection with East Blithedale Avenue at the south, and the Sandra Marker Trail portion of the North/South Greenway at Madera Avenue at Wornum in the north.

Each route was divided into segments based on geography and changes in the type or nature of the road or path facility. The segments were evaluated based on field studies, mapping and analysis of Geographic Information System (GIS) data provided by the Marin County, and through several subject-specific technical analyses.

The objectives of the Study were to identify appropriate improvement concepts for each of the three study routes to accommodate bicyclists and pedestrians, and provide a thorough analysis of all the technical issues associated with the improvements. The improvement concepts reflect careful consideration of extensive input received from the public at and after the first Study workshop, and input from agency staff on the Technical Advisory Committee. Each of the three routes was studied equally, and although they are compared based on selected evaluation criteria in section 3 of the Study, there is no intent to select a preferred alternative. It may ultimately be appropriate to improve

two or even all three of the routes. The information in this Study is provided as part of the basis for future discussion and decision-making. Cost estimates, which are detailed in Section 4, are very preliminary planning-level costs reflecting a number of assumptions about the improvements and the construction requirements.

Improvement Concepts

On All Routes:

Additional traffic control and warning signs, route wayfinding signs, and milepost signs/markers (costs included in individual segment and route estimates).

Route A – Horse Hill Route

East Blithedale Avenue (segment 11A): Minor improvements at the existing Mill Valley to Sausalito Path to make it easier for bicyclists and pedestrians to cross (serves all 3 routes). Potentially a future bike/pedestrian undercrossing or overcrossing at this point

Existing multi-use path north of East Blithedale (segment 1): Add a parallel pedestrian path along the existing path and designate the existing path for bikes; add a ramp from the path to Ashford, similar to the existing ramp near Maguire Elementary School

At Maguire Elementary School (segment 2A): Add a segment of multi-use path to bypass the current route through the school parking lot.

Lomita Drive (segment 2B): Extend sidewalks and a pedestrian path along the north side, to Shell, and along the south and east side of Lomita from Shell to the Horse Hill Path, and associated crossing improvements for the pedestrian path. Striping and signage improvements for bicyclists on the existing designated route along Lomita.

Horse Hill Path (segment 3): Widen path and provide improved crash and headlight glare barriers to improve the function and aesthetics of the route. Option to create sunken and raised pathway segments to slightly reduce grades and increase sense of separation from freeway traffic.

More direct path connection to Meadowsweet Drive to eliminate U-turn currently required for bikes to access.

Meadowsweet Drive (segment 4A): signing and marking improvements for this existing designated bike route, and minor localized shoulder widening and center striping at curves. Adding pedestrian facilities is not seen as feasible due to topography, vegetation and adjacent private improvements, or warranted by existing pedestrian use or demand. Sidewalks exist on the northern portion.

Casa Buena Drive (segment 4B – alternative to 4A): widen shoulder to provide bike lanes on the southern portion, and widen to provide wider striped shoulders on the northern portion (widening to provide full bike lanes would require reconstruction of existing sidewalks and potential impact on private improvements and is not considered warranted). The far northern east-west portion already has bike lanes. Adding pedestrian facilities on the southern portion is not seen as feasible due to topography, vegetation and adjacent private improvements, or warranted by existing pedestrian use or demand.

Sanford Street (segment 5): widening of intersection from Meadowsweet to Tamalpais to provide bike lanes and adding a crosswalk at Meadowsweet (part of separate study Greenbrae/Highway 101 Corridor Study by TAM).

Madera Boulevard and Tamal Vista Boulevard to existing Sandra Marker Trail (segment 6): Stripe and sign for Class II bike lanes from Tamal Vista north; future ADA upgrades to sidewalks and driveways. (part of separate study Greenbrae/Highway 101 Corridor Study by TAM)

Estimated cost:

Route 4A or 4B: \$4.4 - \$5.5 million

Sunken Path Option: \$9 - \$10.2 million

E. Blithedale Separated Crossing: add \$3.4 - \$4 million

Route B – Alto Tunnel Route

Railroad route from Vasco Court to Alto Tunnel (segment 7): trim and remove some native trees and vegetation; improve or construct drainage ditches to convey runoff from above the tunnel portal to nearby Sutton Manner Branch Creek; construct a 10' wide bike path and parallel 8' wide pedestrian path, with emergency vehicle turnaround as close as possible to the tunnel; construct gates, bollards, signs, fire hydrants and related safety features at the tunnel portal.

Alto Tunnel (segment 8): Monitor and protect existing structures nearby by underpinning, building retaining structures, and/or grouting. Remove plugs and fill in tunnel and place steel and concrete supports and shotcrete (sprayed concrete) liner to provide clear interior dimensions 13 feet wide by 16 feet tall and pave a 12' wide multi-use pathway. Provide safety and security features as recommended by Public Safety personnel.

Railroad route from Alto Tunnel to existing path near Montecito Drive (segment 9A): trim and remove some native trees and vegetation, install subsurface storm drains to convey runoff from above the tunnel portal to nearby storm drain system; construct 10' wide bike path and parallel 8' wide pedestrian path.

Existing sidewalk/path along railroad route to Redwood Avenue (segment 9B): Reconstruct to widen existing 8 foot sidewalk to a 12 foot multi-use path (requires transitioning from the separate pedestrian and bike paths proposed to the south). Construct bypass path around bus shelter at north end of existing path (absorbs a few existing parking spaces along Montecito Drive). Provide high-visibility crosswalk at Redwood Ave.

Railroad route along Montecito Drive and through parking area and along existing Sandra Marker Trail (segment 10): Construct a 12' wide path through the parking area to connect to the existing Sandra Marker Trail by widening the existing planting strip and adding 2 crosswalks. Add a parallel pedestrian path along the existing Sandra Marker Trail and designate the existing path for bikes.

Estimated Cost:

\$48 - \$52 million

E. Blithedale Separated Crossing: add \$3.4 - \$4 million

Route C – Camino Alto/Corte Madera Ave. Route

Improvements to East Blithedale crossing (segment 11A) as noted above, plus:

Short connection along E. Blithedale Avenue from the existing Mill Valley – Sausalito Path to Camino Alto (segment 11): no significant improvements.

Along Camino Alto Road from the intersection of E. Blithedale Avenue to Mill Valley/Corte Madera city limit (segment 12A and 12B): Widen, primarily on the west side, involving some retaining walls, and re-stripe to provide either two 5 foot wide bike lanes (City of Mill Valley policy preference) or a single 8 foot wide bike climbing lane on the east/uphill side with a slightly wider west shoulder. The lane(s) would need to be slightly narrower on the northern portion of the route due to steeper topography and adjacent native vegetation. As an option, extend existing sidewalks near Overhill Road south to E. Blithedale. Adding separate pedestrian facilities on the northern portion is not seen as feasible due to topography and adjacent native vegetation, or warranted by existing pedestrian use or demand.

Along Corte Madera Avenue from Mill Valley/Corte Madera city limit to and along Redwood Avenue (segment 13A and 13B): widen to provide room for approximately 5 foot wide bike climbing lane on the west/uphill side on the narrow and winding portion. Reconstruct existing informal path along the west side. Potentially narrow vehicle lanes to provide 5 foot bike lanes on the lower, northern portion of Corte Madera Avenue and on Redwood Avenue

Railroad route along Montecito Drive and through parking area and along existing Sandra Marker Trail (segment 10): improvements as noted above under Alto Tunnel Route.

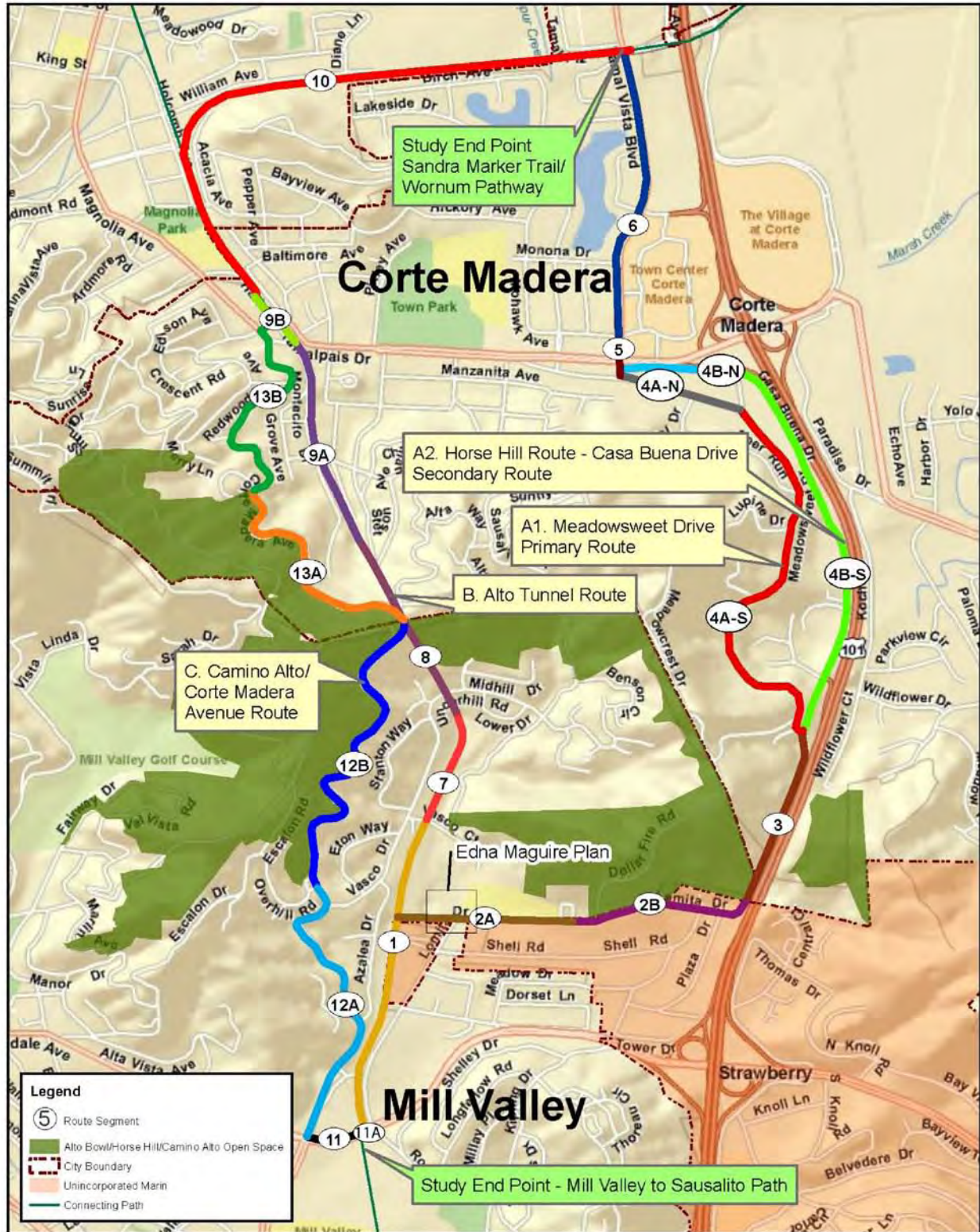
Estimated Cost:

\$4.6 million

With sidewalk extension to Overlook Road: \$5.5 million

E. Blithedale Separated Crossing: add \$3.4 - \$4 million

Figure 1-2: Study Area Routes and Segments



1.4 Organization of the Report

The Study Report includes this Introduction, and the following sections:

- **Section 2, Improvement Concepts**, describes general and site-specific issues and specific conceptual improvements to the three alternative bicycle and pedestrian routes;
- **Section 3, Alternatives Evaluation**, summarizes and contrasts the alternative improvement projects against a set of criteria that include issues raised in public and agency comments. It is organized in a matrix format that facilitates comparison;
- **Section 4, Cost Estimates**, provides planning-level cost estimates for the alternatives and options, including planning, design, environmental, administration, construction; and operation and maintenance.
- **Section 5, Implementation**, includes potential steps and phases to implement the alternative route improvement conceptual projects.

A series of separate technical study and background documents were prepared for the Study. They are summarized in Sections 1.6 and 1.7.

Appendices – Technical Studies

- Geotechnical Study (Appendix A)
- Tunnel Feasibility Study (Appendix B)
- Drainage Analysis (Appendix C)
- Multi-Modal Traffic Analysis (Appendix D)
- Emergency Response Analysis (Appendix E)
- Environmental Considerations Study (Appendix F)
- Right-of-Way Conditions Analysis (Appendix G)
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1.5 Types of Bicycle and Pedestrian Facilities

The Study uses specific terminology to describe types of bicycle facilities that might be created or improved along the three routes. Three types of bikeways are identified by Caltrans in Chapter 1000 of the Highway Design Manual. These types, and variations that are used in this Study, are described below, and illustrated in Figure 1-3:

Class I Bikeway - Typically called a “bike path,” a Class I bikeway provides bicycle travel on a paved right-of-way completely separated from any street or highway. The Highway Design Manual specifies the dimensions and geometry of Class I bikeways precisely, but the term is also applied to

multi-use paths outside of Caltrans jurisdiction that do not necessarily meet these specific design specifications, but are paved paths at least eight-feet wide that are shared by bicyclists and pedestrians.

Class II Bikeway - Often referred to as a “bike lane,” a Class II bikeway provides a striped and stenciled lane for one-way travel on a street or highway. Per Caltrans standards, there will typically be a bike lane on each side of the street for travel in the same direction as motor vehicle traffic. A non-standard alternative is to provide a bike lane, or “climbing lane,” only on the uphill side of a steep grade, and allow bicyclists to share the lane with motor vehicles on the downhill side, where they are better able to keep up with traffic.

Class III Bikeway - Generally referred to as a “bike route,” a Class III bikeway provides for shared use with motor vehicle traffic and is identified only by signing. Optional Shared Roadway Bicycle Marking pavement stencils are also available for use on Class III bikeways.

It is important to note that bicycles are permitted on all roads in the State of California (with the exception of access-controlled freeways). The designation of certain roads as Class II or III bicycle facilities is not intended to imply that these are the only roadways intended for bicycle use. Rather, the designation of a network of Class II and III on-street bikeways recognizes that certain roadways are optimal bicycle routes, for reasons such as directness or access to significant destinations

Pedestrian Facilities - Creation of separate pedestrian facilities is also included in the Study. These include concrete sidewalks with curb and gutter, and asphalt paved (A.C. or Asphaltic Concrete) paths. Sidewalks or paths are typically at least five-feet wide and must include suitable surface, curb ramps, maximum slopes and other design details to comply with standards for access to people with disabilities set by the Americans with Disabilities Act (ADA) and pertinent California access laws. Class I bikeways that are multi-use paths must also meet these standards. The maximum slope standards do not apply when the route abuts a road that has a gradient exceeding the standard.

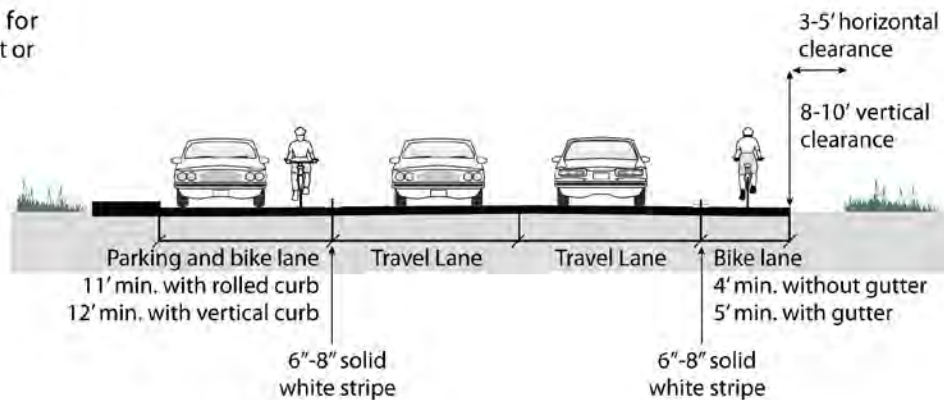
**CLASS I
Multi-Use Path**

Provides a completely separated right of way for the exclusive use of bicycles and pedestrians with crossflow minimized.



**CLASS II
Bike Lane**

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



**CLASS III
Bike Route
Signed Shared Roadway**

Provides for shared use with pedestrian or motor vehicle traffic, typically on lower volume roadways.

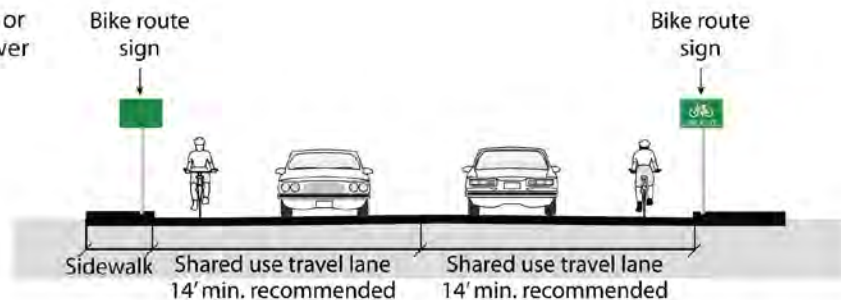


Figure 1-3: Caltrans Bikeway Classifications

1.6 Technical Studies Summary

Eight separate but coordinated technical studies were prepared by the Study team to identify and address the technical issues and develop conceptual designs for improvements along the three alternative routes. The scope of each study is summarized below. The complete study documents are provided in the Appendices of the Study Report. The results of these studies are reflected in the Improvement Concepts in Section 2 and the Alternatives Evaluation in Section 3.

Geotechnical Study (*Appendix A*)

Jacobs Associates prepared a geotechnical study to provide part of the basis for development of conceptual tunnel rehabilitation recommendations. This study consisted of review of existing data, including published and unpublished geologic maps and geotechnical reports, as well as review of the 2001 Alto Tunnel Scoping Study prepared by Jacobs Associates. Jacobs Associates conducted geologic field reconnaissance above the tunnel, including mapping of portals and approaches to the portals to gather data on rock properties, such as joint orientations and rock mass classification. The study included data regarding the Marin Municipal Water District (MMWD) Camino Alto Tunnel (a water supply tunnel), which lies 170 feet above, and parallel to, the Alto Tunnel. This provided geotechnical information for the middle third of the Alto Tunnel, which is currently inaccessible. Jacobs Associates had previously performed a limited inspection of the construction shafts of the water tunnel, and has remotely photographed the railroad tunnel.

Tunnel Feasibility Study (*Appendix B*)

Jacobs Associates prepared conceptual designs for tunnel rehabilitation based on the Geotechnical Study. The conceptual designs for tunnel stabilization developed by Jacobs Associates in the 2001 Alto Tunnel Scoping Study were applicable for pathway use, subject to slight modification. Issues and solutions for developing the surface routes from the existing paths to the tunnel portals were also assessed.

In addition to a safe process and result for the structural rehabilitation of the tunnel, key design objectives included ventilation systems for the tunnel; lighting, fire detection and suppression, emergency communications, security and remote surveillance for the tunnel, development of the portal area slopes for long term stability and low maintenance requirements, and developing safe transitions between the surface corridor and the tunnel corridor by considering adequate sight distances and surface transitions. Available utility maps were also reviewed for overhead, surface and underground utilities which could impact the permitting or construction.

The Tunnel Feasibility Analysis also included evaluation of need and potential scope and cost to prepare a future Hazardous Materials Corridor Study (HM Corridor Study) for the potential re-opening of the Alto Tunnel. The primary potential source of hazardous materials will be the old creosote-soaked timbers, roadbed and water within the tunnel. The HM Corridor Study Determination is a subset of a Phase I environmental site assessment and is specific to projects where contaminated soil and groundwater may be encountered during construction. The goal of the HM Corridor Study is to identify potential future HM issues and to avoid contamination or assist in locating, quantifying, and negotiating with agencies or disposal facilities to minimize the cost and time of handling any contaminated materials during construction.

Section 2 summarizes the improvements recommended in Appendix B by Jacobs Associates for the Alto Tunnel and adjacent areas.

Drainage Analysis (*Appendix C*)

Nolte Associates prepared a preliminary drainage analysis to identify locations of problems, their nature and extent, and conceptual design solutions. The tunnel portals areas both have standing water during wet conditions, and the tunnel itself is expected to be wet due to surface runoff and/or groundwater. There are drainage issues along the Horse Hill and Camino Alto corridors, but these are not significant constraints for these routes and the solutions are relatively standard measures that are incorporated into general improvement concepts. Section 2 summarizes the drainage improvements recommended in Appendix C by Nolte Associates for the Alto Tunnel and adjacent areas.

Multi-Modal Traffic Analysis (*Appendix D*)

Parisi Associates, Traffic Engineers, prepared an analysis to describe conditions on roadways associated with the alternative routes between Mill Valley and Corte Madera, to summarize reported collisions involving pedestrians and bicyclists along these routes, and to provide a preliminary list of potential multi-modal solutions to address existing deficiencies. The scope includes analysis of available crash data, existing and projected traffic volumes, speeds, potential traffic operations, and sight distance constraints. The analysis evaluated alternatives for improvement of bicycle and pedestrian access across and along streets on the routes, including intersection, travel lane, bike lane, and pathway configurations. These improvement concepts are reflected in Section 2.

Emergency Response Analysis (*Appendix E*)

Parisi Associates and Alta/LandPeople prepared an analysis detailing strategies for emergency response for the three alternative routes, primarily focused on the Alto Tunnel Route, which is the only new route among the three alternatives, and because of the unique conditions and challenges of a tunnel route. The analysis was based on the Project Team's past experience with similar bicycle and pedestrian route projects, including routes in tunnels, field reconnaissance of the study routes, interviews with the Study Area's Emergency Service Departments, and interface with the parallel Tunnel Feasibility Study.

To better understand the needs, questions, and recommendations of the area's emergency services, the Project Team held two meetings with the County of Marin, Corte Madera Fire Department, Twin Cities (Corte Madera and Larkspur) Police Department, and Mill Valley Police Department. Notes from these meetings are included with the Emergency Response Analysis and reflected in the Improvement Concepts in Section 2.

Environmental Considerations Study (*Appendix F*)

LSA Associates prepared a preliminary study of environmental considerations for the alternative routes. This was not a formal environmental document, which is not required for a planning study, but was intended to provide information about environmental issues and processes that may be required if the improvement concepts for any of the routes were pursued. The scope included background research and a biological field survey to identify potential significant adverse impacts to environmental resources that could occur along the three alternative alignments. LSA reviewed available documents pertaining to the bike and pedestrian corridor and conducted field visits to identify potential environmental issues and constraints. LSA conducted a biological resources assessment to identify any significant adverse impacts to biological resources and special status species using available material; obtained a list of special status species from the U.S. Fish and Wildlife Service (USFWS); and queried the California Natural Diversity Data Base and California

Native Plant Society Online Database. LSA also conducted a cultural resources study consisting of a records search of the project area, a literature and cultural resources inventory review, and consultation with the Native American Heritage Commission (NAHC).

After the conceptual improvements for the three alternative routes were confirmed, LSA completed a preliminary Initial Study checklist and summary of potential impacts for each of the alternatives proposed in the Corridor Study. The summary generally identifies anticipated environmental documentation, technical studies, surveys, clearances, agency coordination and required permits associated with the alternatives, based on current knowledge.

Right-of-Way Conditions Analysis (*Appendix G*)

Alta/LandPeople prepared an analysis summarizing right-of-way conditions for the Alto Tunnel Route based on information available from the County of Marin, the Northwest Pacific Railroad Historic Society and other sources. According to parcel data available from Marin County, the Alto Tunnel passes through several parcels. Some portions of the route, including the tunnel, are on/under private parcels. Some portions are on/under property owned by the County as part of the railroad right-of-way purchase, or owned by the two cities as street right-of-way.

Based on the results of right-of-way research, a process of negotiation, documentation and purchase would be conducted for any necessary right-of-way acquisition.

Route Use Counts and Projections (*Appendix H*)

An analysis was prepared by Alta/LandPeople to estimate the potential number and variety of recreational and commuting users of the three routes if the conceptual improvements were implemented.

Alta/LandPeople conducted bicycle and pedestrian counts at each end of the study corridor during the hours of peak usage. These were supplemented with two sets of counts taken from the 2008 Transportation Authority of Marin counts and Non-motorized Transportation Pilot Program (NTPP).

Based on the counts, and using the established methodology for estimating use of bicycle and pedestrian routes, an estimate of current use of the two existing routes was prepared, and presented with use information for adjacent paths (see Table 1-1).

Table 1-1: Project Area Estimated Existing Average Daily Traffic (ADT) ¹

Location	Facility Type	ADT	Pedestrians	Bikes
Camino Alto	Road	981	157	824
Horse Hill Path	Class I-III	414	66	348
Mill Valley-Sausalito Path	Class I	3,209	642	2,567
Larkspur-Corte Madera Path	Class I	1,289	258	1,031

Estimates of projected use of the new and improved facilities were then prepared, including informed judgments about the allocation of projected regional increased use among the three facilities (see Table 1-2).

¹ ADT is the annual estimate divided by 365, or the number of days in a year.

It is estimated that a daily average of approximately 380 bicyclists and 72 pedestrians would use the Horse Hill Path, or a 10% increase from the number currently estimated to be using this route. Though some improvements are recommended for this route, many of the constraints (circuitous, next to highway) cannot be overcome with new improvements.

An estimated daily average of approximately 1,863 bicyclists and 466 pedestrians would use the Alto Tunnel based on the assumption that the volume of bicyclists and pedestrians would be approximately half the volumes on the Mill Valley-Sausalito Pathway and the Sandra Marker Trail in Larkspur.

An estimated daily average of approximately 1,036 bicyclists and 197 pedestrians would use the Camino Alto/Corte Madera Avenue Route based on the assumption that there will be a 25% increase over current estimated annual volumes with the completion of climbing lanes or bicycle lanes and related improvements that will attract new bicyclists and pedestrians.

To forecast the reduction in vehicle miles travelled (VMT), the percentage and length of transportation-related trips was estimated based on NTPP survey results. Pedestrian transportation trips are assumed to be 1.5 miles long and bicycle transportation trips are assumed to be 10 miles long. As shown in Table 4, the Alto Tunnel is estimated to save the most VMT of the three alternatives. These VMT savings are totals, rather than net – they show the relative benefit of the three alternatives assuming all were improved, compared to a baseline of zero.

Table 1-2: Project Area Estimated Annual Users, Average Daily Traffic (ADT) and Benefits

Daily Use and Benefits

Location	Facility Type	Annual Estimate	Transportation			VMT Saved
			ADT	Pedestrians	Bikes	
Alto Tunnel	Class I	850,000	2,329	466	1,863	7,201
Camino Alto	Class II	450,000	1,233	197	1,036	3,962
Horse Hill Path	Class I-III	165,000	452	72	380	1,453

1.7 Other Background Information

Three additional appendices contain background information for the Study:

Inventory and Description of Routes (*Appendix I*)

This provides an overview of the routes – their current conditions and the opportunities and constraints for improving them as bicycle and pedestrian routes. Information on conditions relating to the Alto Tunnel, traffic conditions and potential solutions, emergency access and response, potential use levels of the routes, and environmental conditions and issues is provided in the technical studies described above.

Public and Agency Comments Summary (*Appendix J*)

This summarizes the comments received at the public workshop, in follow-up communications, and at meetings of the project Technical Advisory Committee.

Background Documents (*Appendix K*)

This reviews the significant regional and local plan and policy documents that provide context for the Corridor Study.

Detailed Cost Estimates (*Appendix L*)

This provides the detail of planning-level cost estimates for improvements described in Section 2, and in the Tunnel Feasibility Study (Appendix B), and Drainage Analysis (Appendix C).

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2 Improvement Concepts

2.1 Summary

This section describes specific conceptual improvements to the three alternative bicycle and pedestrian routes to best accommodate bicyclists and pedestrians and avoid or minimize conflicts with other uses or resources. Each route improvements description is organized into a series of segments based on changes in facilities or conditions along the route. A detailed inventory and description of the routes is contained in Appendix I of the Study.

The Master Map Legend at right indicates features shown on the segment maps that follow in this section. The sign schedule on the following page provides more detail on signage design and placement concepts.

Inventory of existing conditions and design of conceptual improvements are as accurate and detailed as possible given the available base data. They include generalizations and assumptions typical to a planning-level study.

The total estimated improvement cost is listed for each segment or sub-segment. These are very preliminary planning-level cost estimates based on conceptual designs and a series of assumptions, as detailed in Section 4.

2.2 Study Objectives and Issues

Improving bicycle and pedestrian connectivity is the primary objective of the study. Avoiding or minimizing impact on adjacent land uses is a parallel objective. The alternative routes present many opportunities, and many challenging conditions and issues, associated with these objectives. The relevant issues are described in the introduction to the improvement concepts for each alternative route, and in specific segment descriptions where applicable. Improvement ideas and technical solutions were identified through research and public or agency comments, and detailed and analyzed through development of the route improvement concepts.

The alternatives evaluation section summarizes and contrasts the performance of each alternative route with respect to these issues. The Environmental Considerations Study highlights the primary environmental issues identified through a cursory evaluation and provides a general assessment of the significance of environmental issues. Formal analysis and response to environmental issues from a CEQA or NEPA (triggered with federal funding) standpoint is beyond the scope of the study, and would occur as part of future work to proceed with any of the alternatives.

Master Map Legend

Study Routes

Existing Facilities

- Class I Multi-use Path
- Class II Bike Route
- Class III Bike Route

Potential Facilities

- Class I Multi-use Path
- Class II Bike Route (or Climbing Lane)
- Class III Bike Route (Shared with Traffic)

Other Designated Routes

- Class I Multi-use Path
- Class II Bike Route
- Class III Bike Route
- Existing Parking
- Parcel
- Alto Tunnel
- Existing Crosswalk
- Existing Sidewalk
- 5 Foot Contours
- Drainage Ditch

Existing Signage

- Bike Route
- Share The Road
- Yield to Peds

Proposed Signage

- Bike Route/Directional Sign(s)
- Milepost

Traffic control & warning signs described in report

2.3 Signage Concepts

There is an existing County system for designating, mapping, and signing bicycle routes. This system should be used and enhanced in conjunction with the improvement of any of the routes. The improvement concept maps show the location of existing route signs and indicate the location of proposed route signs, which should occur at each path juncture in locations that would be legible to users traveling in either direction.

Emergency services staff commented that there is a need for mileposts along the routes so that persons calling for assistance can identify their approximate location and emergency personnel can coordinate. The improvement concept maps and cost estimates assume that a trail mileage plaque similar to the illustration in Figure 2-1 below will be placed in conjunction with each route directional sign post and at 0.5 mile intervals along the route. This also could be achieved by painting the mileage and route numbers on the pavement.

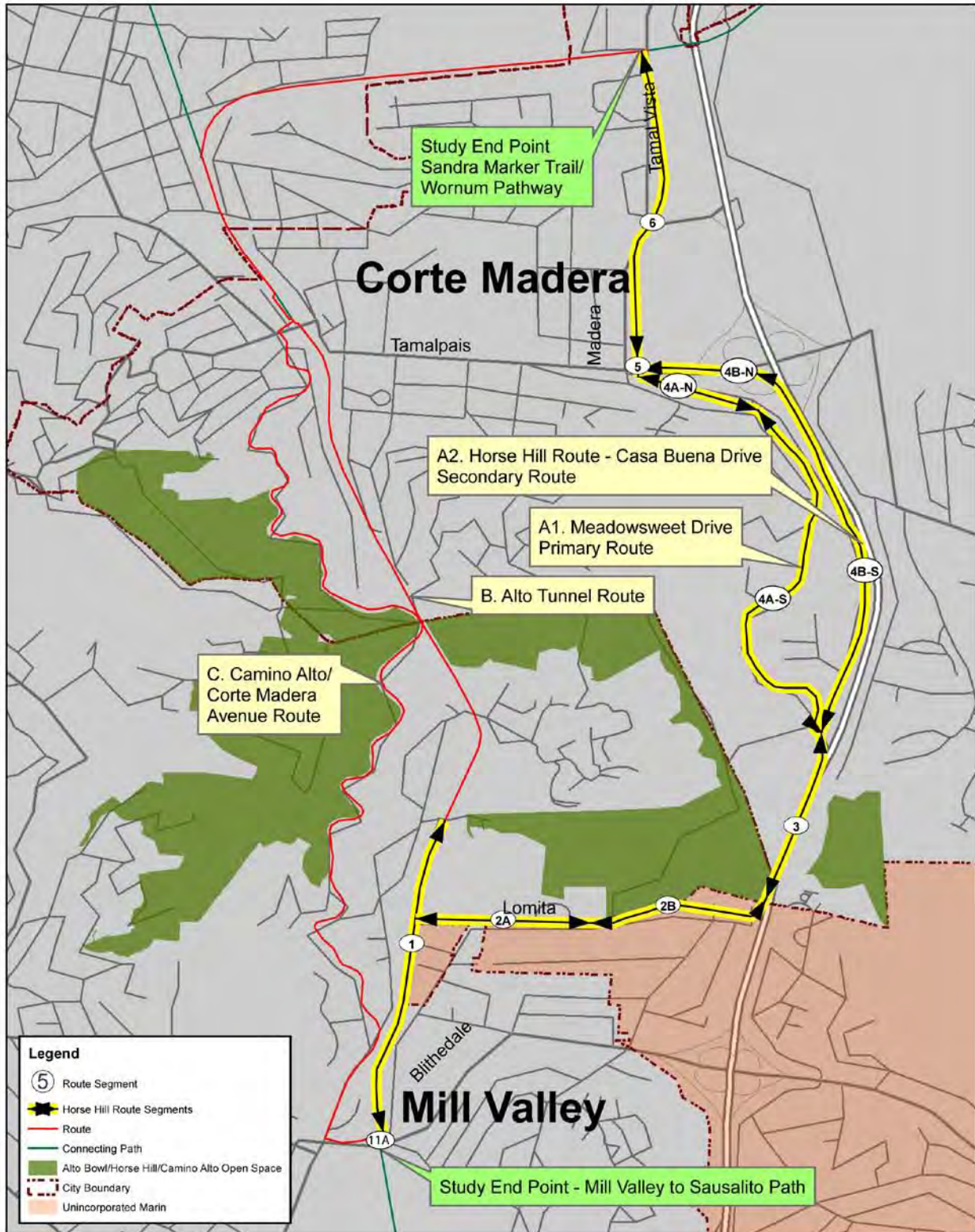


Example of County bike route signage.



Figure 2-1: Trail Mileage Marker per Manual of Uniform Traffic Control Devices

Figure 2-2: Horse Hill Route Overview



Route Alternative A - Horse Hill Route

Overview:

The Horse Hill Route, moving south to north, utilizes an existing Class I path built on the former railroad right-of-way leading to the Alto Tunnel. An existing path connects east to and through the parking lot of Maguire Elementary School. It follows Lomita Avenue, a local road that passes by the school and a single family residential neighborhood to the east, terminating at Highway 101 and Marin County's Alto Bowl/Horse Hill Open Space Preserve. The route continues north on a Class I path built in the right-of-way of 101, and follows Casa Buena Drive, a frontage road of 101 with rural residential land uses to the south and commercial land uses to the north, to Sanford Street. Meadowsweet Drive offers an alternative route to Casa Buena on a winding road through a rural residential area, transitioning to denser residential development, and finally multi-family residential near Sanford Street. The route continues north along Madera Boulevard and Tamal Vista Boulevard to the eastern terminus to the existing Sandra Marker Trail, which is constructed on the same former railroad line as the Alto Tunnel. The portion north of Tamalpais is part of a concurrent study sponsored by the Transportation Authority of Marin (TAM).

This route consists of eight segments, plus an alternative route for one segment:

Segment 11A: Crossing improvements on East Blithedale Avenue at Lomita Road, at the northern end of Mill Valley Sausalito Path.

Segment 1: Functions as part of Alto Tunnel & Horse Hill route. From the northern end of Mill Valley-Sausalito Path at East Blithedale Avenue to Vasco Court (an existing facility).

Segment 2A: From bike path at Edna Maguire Elementary School along Lomita Road to Greenfield Court.

Segment 2B: From Greenfield Court along Lomita Road to Horse Hill bike path.

Segment 3: Existing Class I bike path running from end of Lomita Drive parallel to Highway 101 to Meadowsweet Drive.

Segment 4A: From the intersection with the northern end of the Horse Hill path and Meadowsweet Drive, along Meadowsweet Drive to Sanford Street (has North and South sub-segments).

Segment 4B (Alternative to segment 4a): Casa Buena Drive from northern end of Horse Hill path to Sanford Street (has North and South sub-segments)

Segment 5: Sanford Street from Meadowsweet Drive to Tamalpais Drive.

Segment 6: From Tamalpais Drive to Wornum Way along Madera Boulevard and Tamal Vista Boulevard to the study end point.

Total length is 15,570 feet/2.9 miles following Segment 4A, or 15,330 feet/2.9 miles following the alternative Segment 4B.

Issues:

Bicyclist safety, utility, and comfort. This is a designated County bike route. The improvement needs and opportunities for bike access are generally limited and site-specific. They are detailed in the segment improvement concept descriptions. They include options to improve the clarity and function of Class III shared routes, potentially to upgrade Casa Buena Drive to a Class II route with bike lanes, add parallel pedestrian connections, and address gaps and constraints in bicycle and pedestrian connections at several specific points. The Horse Hill Path along 101 is subject to noise and glare from the adjacent freeway. The route includes some steep hills – up to 10% on the Horse Hill Path, and 8% on Casa Buena. Options for improving these conditions are detailed in Segment 3 Improvement Concepts.

Pedestrian access. There are sidewalks along the western portion of Lomita Drive, and on the northern portions of Casa Buena and Meadowsweet, and the connections north along Madera and Tamal Vista. The existing Class I path portions offer adequate facilities for pedestrians as well as bicyclists at the current and projected use levels. The other portions of the route feature sidewalks at the northern end, but most other portions require pedestrians to walk on the shoulder, in many cases where there is minimal space outside the traffic lane. There is not a substantial amount of existing pedestrian use on this route, or desire for it expressed in public comment. Extension of a sidewalk or path along Lomita to the Horse Hill Path is proposed due to proximity to Maguire Elementary School and surrounding neighborhoods. Adding a sidewalk or path along the southern portion of Meadowsweet or Casa Buena is not proposed due to the steep terrain, adjacent development, and low projected pedestrian use.

Impact on adjacent land uses. For this route, the most sensitive adjacent land use is Maguire Elementary School, and other educational programs at this facility (see Segment 2a description for more detail), and the adjacent residential neighborhood along Lomita Avenue, and along Meadowsweet. Providing a continuous pedestrian path could result in impacts on the adjacent residential, commercial, and open space land. Public comments included a suggestion for an alternative route along Ashford Avenue that bypasses the school. The analysis of the route is beyond the scope of the current study, but it is described with Segment 2A for future consideration

Segment 11A Improvement Concepts:

Short connection along E. Blithedale Avenue from northern end of Mill Valley Sausalito Path to Camino Alto. Serves all three study routes.

Issues:

- Bicycle access – East Blithedale is a very busy street and challenging to cross or follow. Bicyclists are connecting to or from the path in all directions.
- Pedestrian and access for persons with disabilities – same issue as for bikes, but less challenging because sidewalks are already provided.
- Impact on traffic flow – There is currently some congestion with bicycle traffic crossing and traffic flow during peak periods. The increased volumes anticipated if the Alto Tunnel route is opened may further impact traffic flow.

Improvement Concepts (see Figure 2-3):

- Install an angled curb ramp (bike ‘off ramp’) on south side of East Blithedale Avenue, just west of the Mill Valley-Sausalito Path to enable direct access to the southbound pathway for eastbound bicyclists. Installation of a curb ramp would substantially reduce the amount of right-hand U-turns made by bicyclists at the Lomita Avenue intersection and the number of bicyclists riding along the southern sidewalk between Camino Alto and Lomita Avenue.
- Widen existing curb ramps at the crosswalk (requires moving utility box on south side of East Blithedale).
- Relocate the crosswalk limit line on west side of East Blithedale/Lomita Avenue intersection two to three feet further to the west to reduce motorists crowding the crosswalk and to improve sight lines.
- Enlarge bicycle queuing space on the southwest and northwest corners of the East Blithedale Avenue/Lomita Avenue intersection along the Mill Valley to Sausalito path to allow more bicyclists to wait during red traffic signal phases and to reduce conflicts with other bicyclists and pedestrians. This will entail extending the headwall and railing on the west side of the creek
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- Crossing warning signs.
- Pedestrian/Bicycle-only signal cycles and timing could be further studied to enhance bicycle and pedestrian crossing efficiencies.

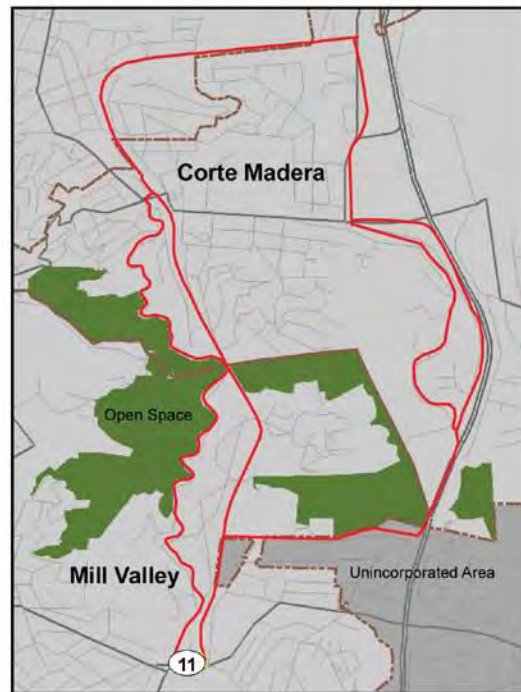
Improvement Cost: **\$84,000**



Segment 11A Improvement Concepts

Figure 2-3

Segment Location Map



Grade Separated Bicycle/Pedestrian Crossing Option:

- Consider construction of a bike/pedestrian bridge or undercrossing. This is an alternative whether or not the Alto Tunnel is opened. In any case, the number of bicyclists and pedestrians crossing East Blithedale will increase significantly on this already congested intersection crossing. An option for future consideration is a bike/pedestrian overcrossing. To meet ADA, intersection crossing grades and provide adequate clearance over the road, the bridge would need to be on the order of 800' long. An undercrossing would require less clearance below the road, and could be on the order of 500 to 600 feet long. The path would need to be redesigned at each end of the bridge or undercrossing to allow passage around the openings, which could impact the wetlands at the south end. Resolving specific design details or impacts of a bridge or undercrossing is beyond the scope of the current study. A conceptual cost estimate for bridge or undercrossing construction and associated costs is included in Section 4. A 20% contingency is added to the basic cost estimate to produce the range below, reflecting the uncertainties in the nature of the proposed improvements and requirements

Improvement Cost: \$3.4 - \$4 million



Figure 2-3: E. Blithedale Improvement Concept

Segment 1 Improvement Concepts:

Functions as part of Alto Tunnel and Horse Hill route. From the northern end of Mill Valley-Sausalito Path to Vasco Court, 3,700 feet/0.7 mile; part is County bike route #5; City of Mill Valley jurisdiction, but maintained by Marin County Parks.

Issues:

- Access for bicyclists, pedestrians, and people with disabilities – connection to Ashford.
- Impact on adjacent land use/private property – design and construction of Ashford ramp connection.

Improvement Concepts:

- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- Ramp to Ashford Avenue (see Figure 2 - 4). Ashford Avenue is county bicycle route #10, extending east as a Class III route and as a westbound-only frontage road along E. Blithedale to Dorset Lane. There is an informal path connection from Lomita Avenue at Ashford to the existing path. Creation of a connection would require construction of a ramp, similar to the ramp near Maguire Elementary School. The Ashford ramp would need to be approximately 200' long, plus landings, to climb the approximate 10' grade from Lomita to the path.
- As increased use warrants, add a separate 8 foot wide pedestrian path parallel to the existing eight-foot paved path and designate the 8 foot path for bikes (see Figure 2-5).
- A high visibility crosswalk with warning signs on Lomita in conjunction with the Ashford ramp.

Estimated Improvement Cost: \$926,000

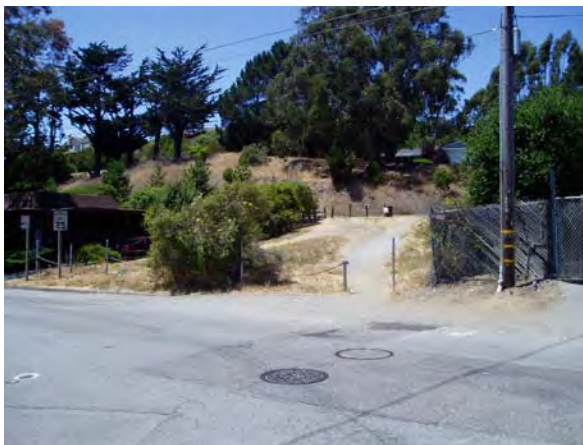
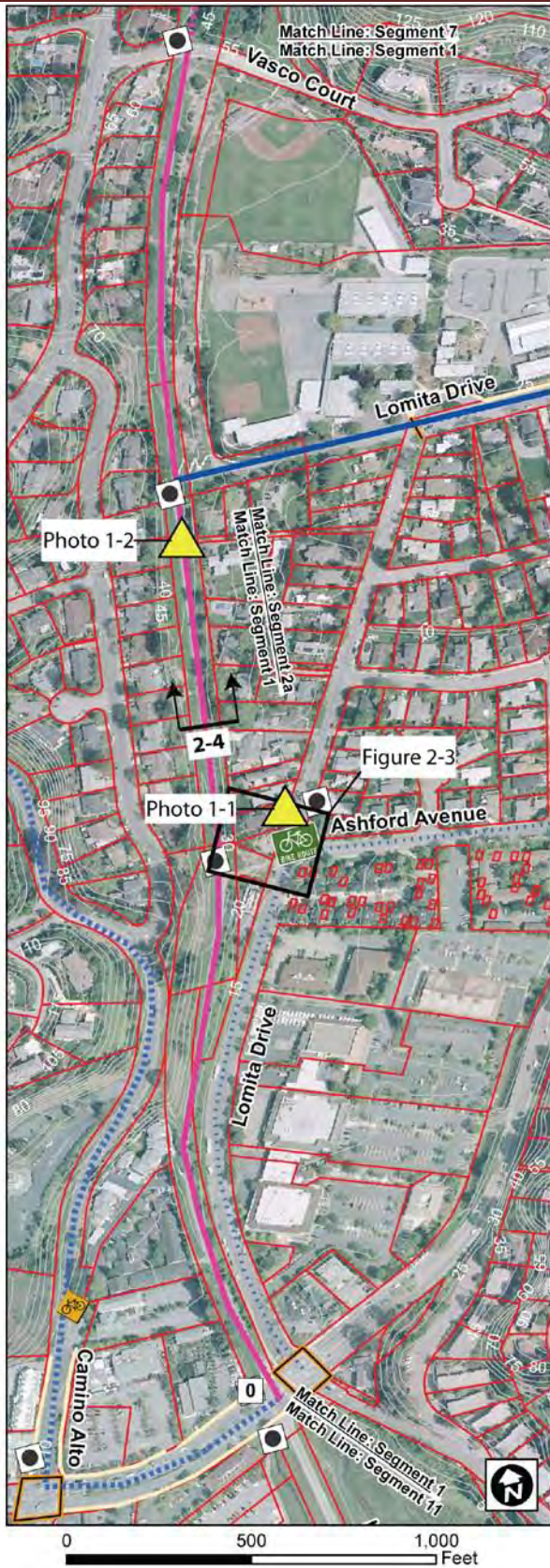


Photo 1-1 View of informal path connection from Ashford to existing path.



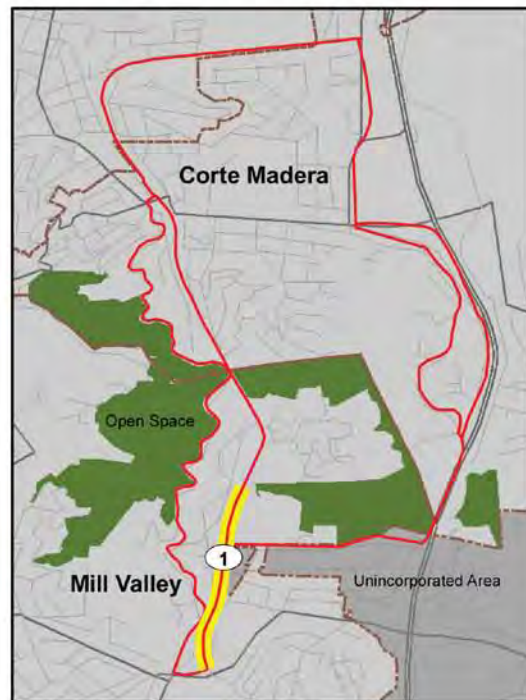
Photo 1-2 View south along path near Edna Maguire Elementary School towards E. Blithedale.



Segment 1 Improvement Concepts

(see page 2-1 for Master Map Legend)

Segment Location Map



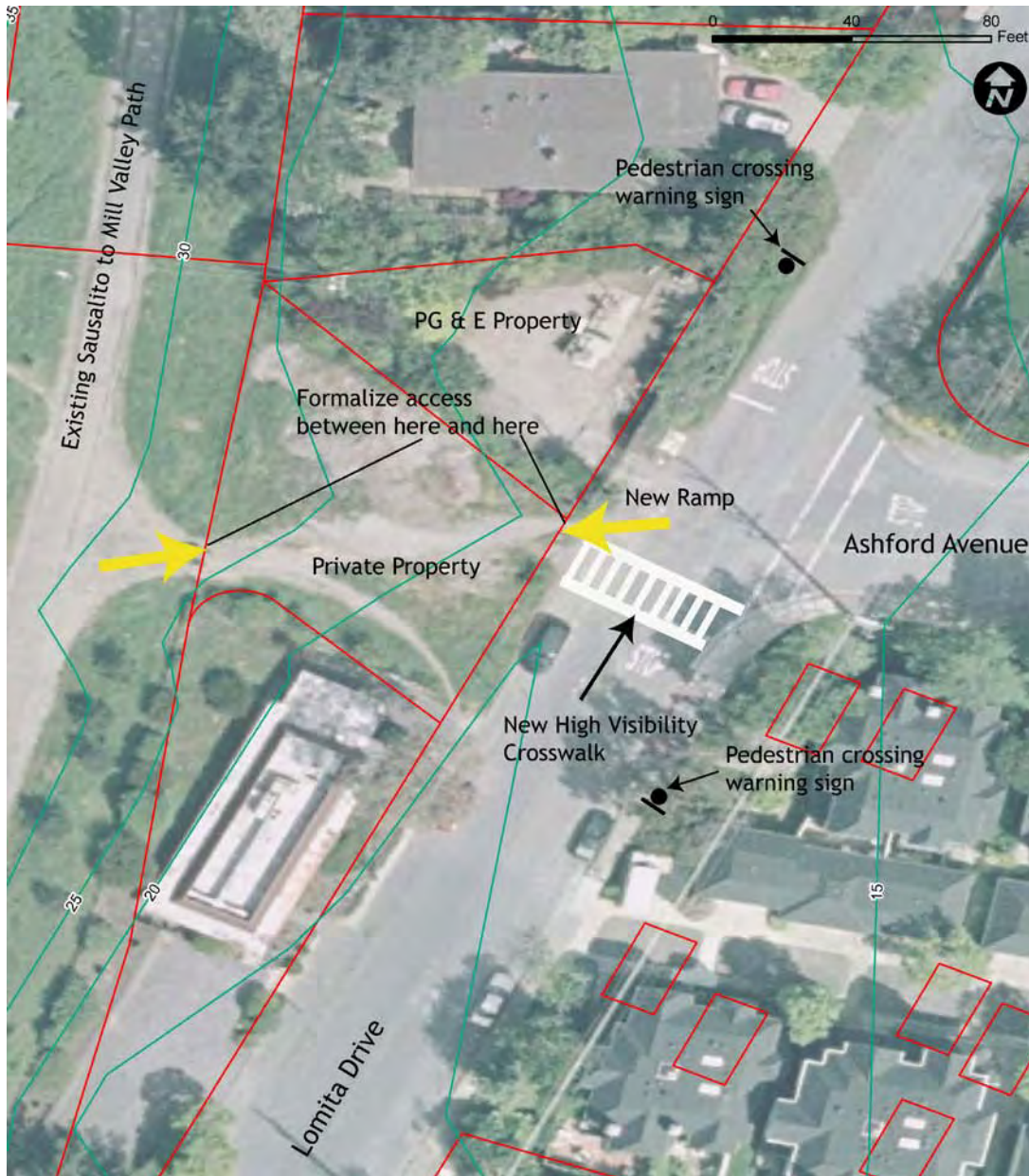


Figure 2-4: Ashford access improvements between MV-Sausalito Path and Lomita/Ashford intersection

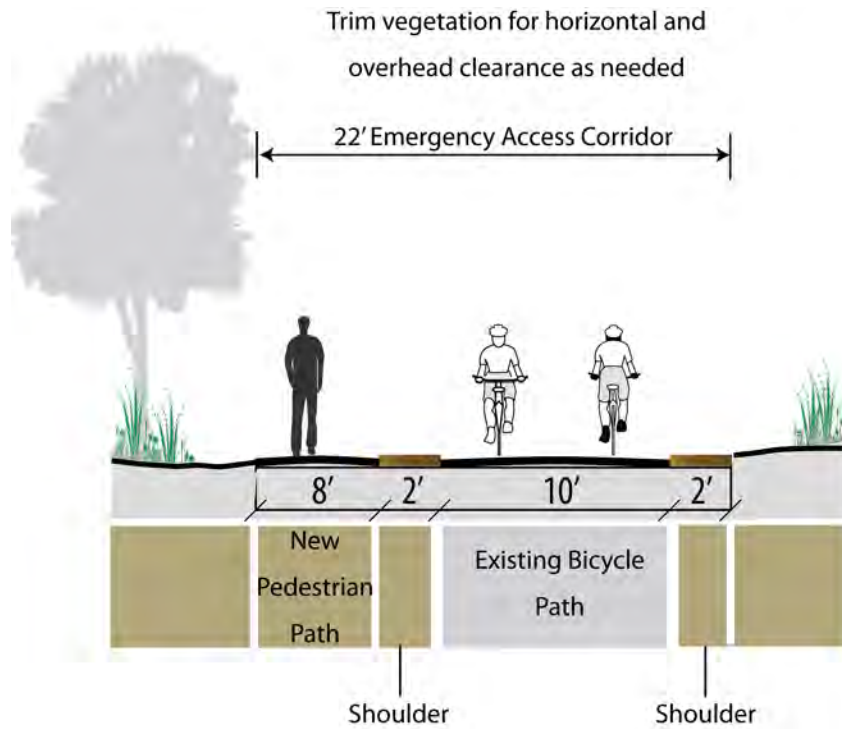


Figure 2-5: Cross-section through existing MV-Sausalito bike path with new pedestrian path

Segment 2A Improvement Concepts:

From Segment 1 bike path at Edna Maguire Elementary School along Lomita Road to east of Greenfield Court; 1,550'/.29 miles; County bike route #5; unincorporated Marin County, except Lomita Avenue from Maguire Elementary south is in Mill Valley.

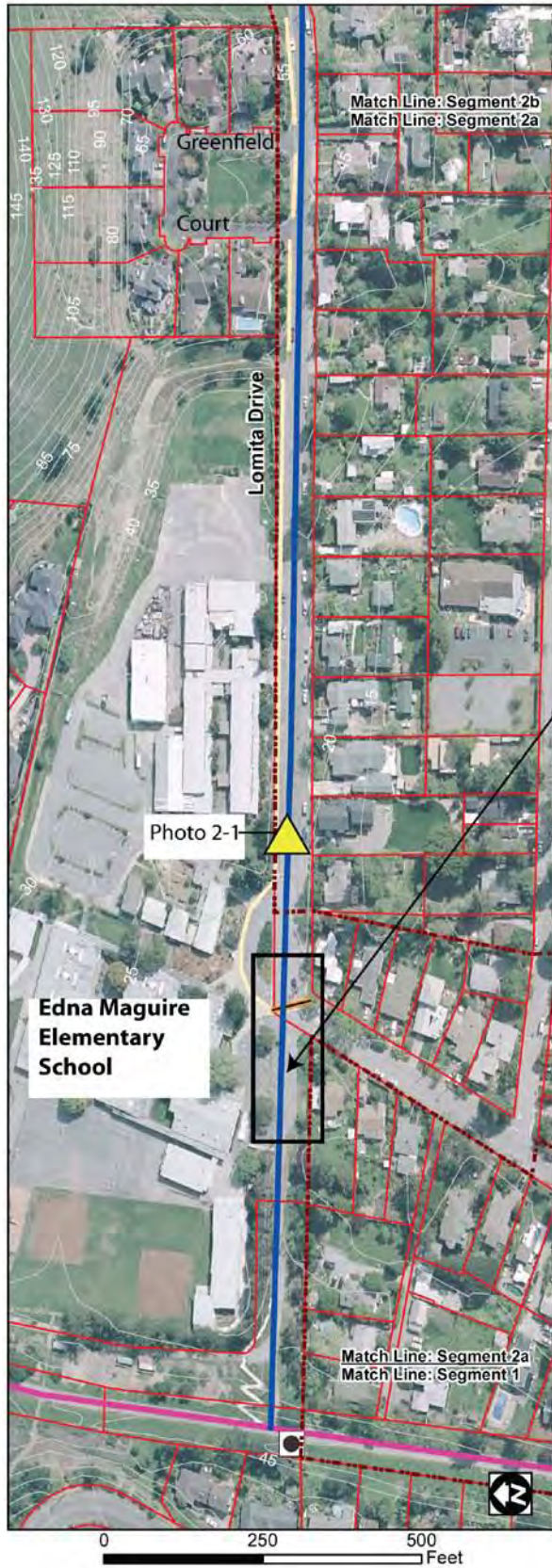
Issues:

- Access for bicyclists, pedestrians, and people with disabilities – connection through school parking lot.
- Impact on adjacent land use/Maguire Elementary School – avoiding/minimizing conflict with school traffic; security concerns for school children. Edna Maguire has approximately 450 students. The private K-8 Ring Mountain School is located next door in a facility leased from the Mill Valley School District. Ring Mountain School has approximately 100 students who live throughout the area, resulting in a high percentage of cars for drop-off and pick-up. There are also two pre-schools on the site; one on either side of Edna Maguire School on District property; Marin Day School with approximately 150 kids on various schedules, and Robin's Nest with less than 100 preschoolers. Crosswalk and ramp improvements across Lomita at the school entry were recently constructed as Mill Valley/TAM Safe Routes to School project.
- Continuing sidewalks or a pedestrian path past the generally steep and rural residential or open space areas would involve some significant expense and localized changes. The study presents options for where and how a sidewalk or path could be added along Lomita due to its proximity to the school.

Improvement Concepts:

- Construct Class I path 8 feet wide bypassing Maguire school parking lot, on School District property, coordinated with District and adjacent property owner (see plan below).
- Construct approximately 50' of sidewalk, driveway ramp, curb and gutter east of the school to close a gap in existing sidewalks along the north side of Lomita.
- Add four curb ramps at the existing sidewalk on Greenfield Court (a loop road with two connections to Lomita).
- On Lomita, shoulder striping outside curbside parking to delineate car lane and provide informal area on pavement for bicycles.
- Add "sharrows" – shared lane markings for bikes.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Estimated Improvement Cost: \$90,000



Segment 2A Improvement Concepts
(see page 1 for Master Map Legend)



Photo 2-1 View East along Lomita Drive

Parking lot bypass improvement concept, see plan figure 2-6

Segment Location Map



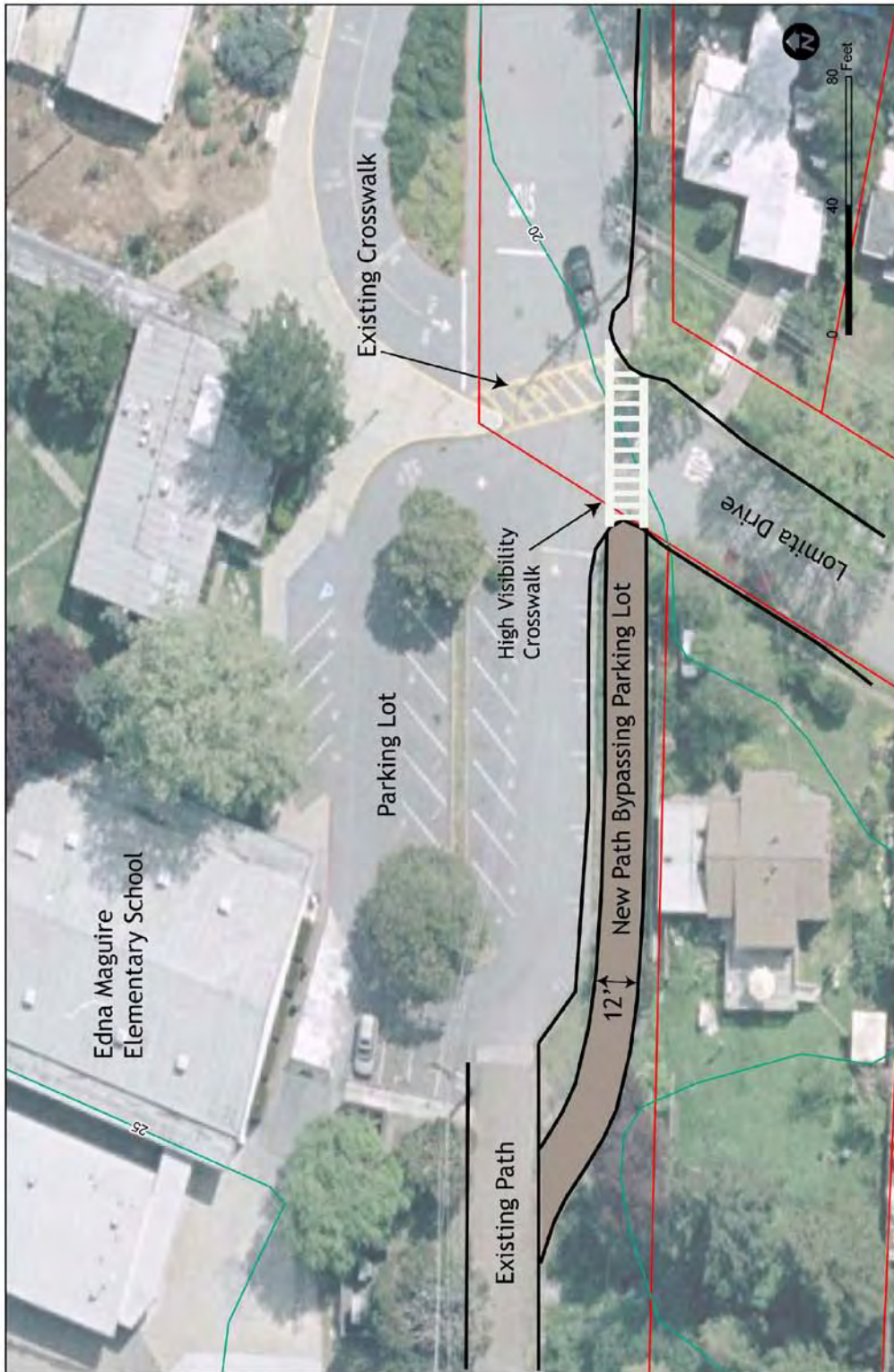


Figure 2-6: Maguire School Bypass Path Concept

Alternative Bicycle Route. Public comments suggested an alternative route to Segment 2 along Lomita, using Ashford Avenue to connect east to Meadow Drive, then north and east on Meadow and Shell Road back to Lomita. The stated advantage is that this route bypasses Maguire School, which is a congested and sensitive area for a major regional bike route. The public comment concept included a connection to E. Blithedale along 101, rather than along neighborhood streets. However, no space was reserved for this connection in the recent off-ramp reconstruction project, so this would entail re-design and reconstruction of that portion of that facility. Also, private improvements along the north side of E. Blithedale between Dorset and Tower bar extension of a Class I path in that vicinity. Further resolution of details of this alternative is beyond the scope of the current study, but it is described here for future consideration.

This alternative route is beyond the scope of the current study, but is mentioned for future consideration. See figure 2-7 below for more information.

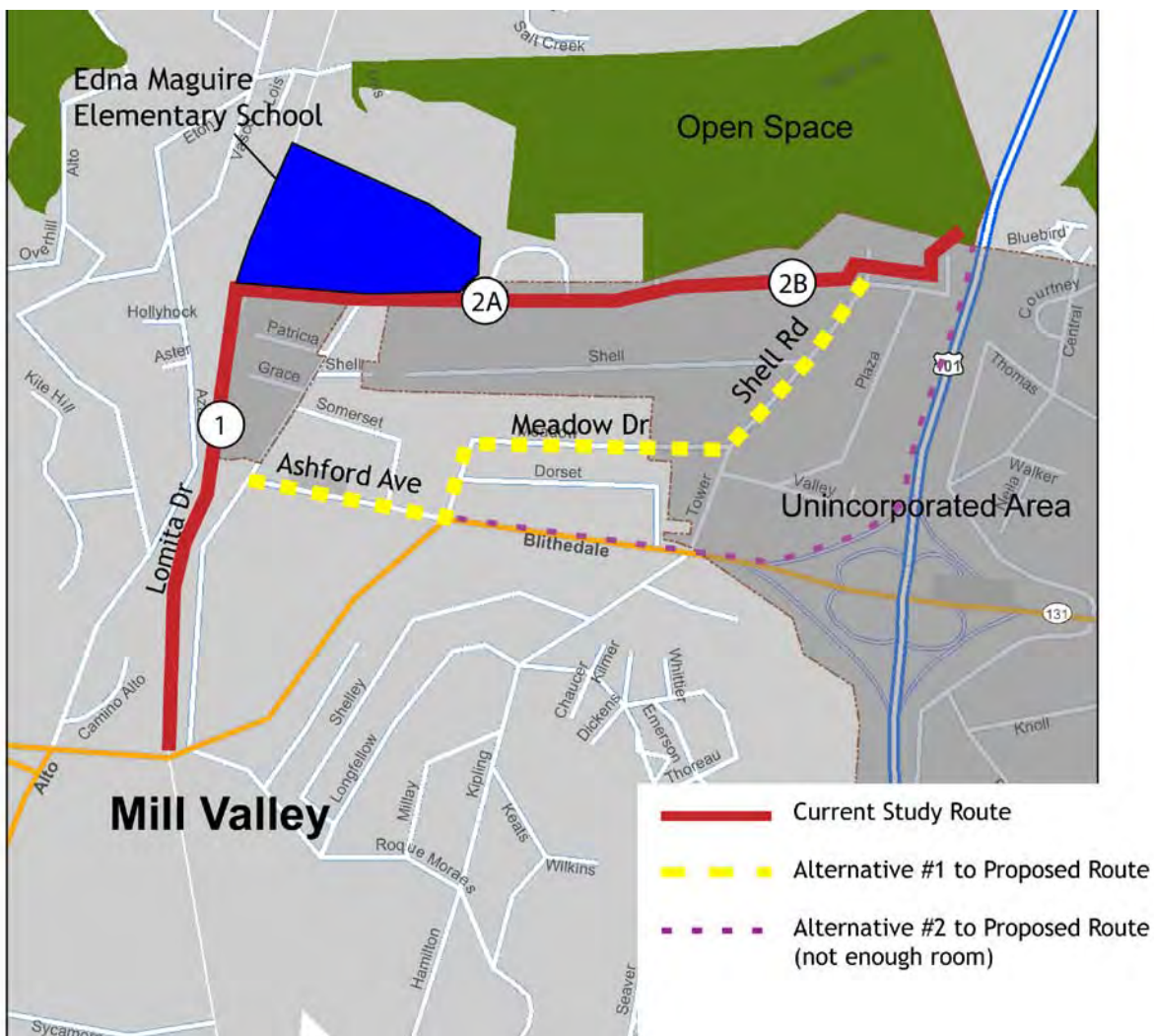


Figure 2-7: Alternative bike route concept

Segment 2B Improvement Concepts:

From Lomita Drive at Greenfield Court along Lomita to Horse Hill bike path; 1,830'/.35 miles; County bike route #5; unincorporated Marin County.

Issues:

- Bicycle access – making route clearer, safer.
- Access for pedestrians and people with disabilities – there is no sidewalk, path, or road shoulder on eastern portion.
- Existing drain ditches and private improvements in the right-of-way. Nine homes front Lomita on the north side beyond the open space. Steep slopes, driveways and other improvements in the right-of-way, along with a drainage ditch, are constraints to extending a path along this frontage.

Improvement Concepts:

- Add 5' wide A.C. pedestrian pathway on north side of Lomita to extend sidewalk east in road right-of-way along frontage of Open Space (see Figure 2-8). Part may require a low retaining wall above or below the trail.
- Replace the existing open ditch fronting three homes with a storm drain connecting to an existing inlet on the north side of Lomita west of Shell Road.
- Extend a sidewalk or pathway on the north side of Lomita from the open space frontage to Shell Road.
- Construct curb ramps for sidewalk on south side of Lomita at Shell Road and Plaza Drive (4 required).
- High visibility crosswalks on Lomita at Shell Road and Plaza Drive (3 required), with warning signs.
- Extend a sidewalk on the south and east side of Lomita from Shell to the Horse Hill path.
- Minor pavement widening on the north and west side of Lomita to compensate for space taken by sidewalk.
- Shoulder striping outside curbside parking to delineate space for bikes (not a formal bike lane, but acts as a traffic calming feature).
- Add “sharrows” shared lane markings for bikes.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: \$486,000



Photo 2- 2 View East along Lomita Drive at end of sidewalk at Open Space



Photo 2- 3 View East along Lomita Drive at end of Open Space frontage



Segment 2B Improvement Concepts

- New sidewalk
- Widen Pavement 2'-3' from start of bend north to end of Lomita Drive
- 3 high-visibility crosswalks with handicapped ramps
- Place storm drain in existing ditch, construct new path/sidewalk

Segment Location Map



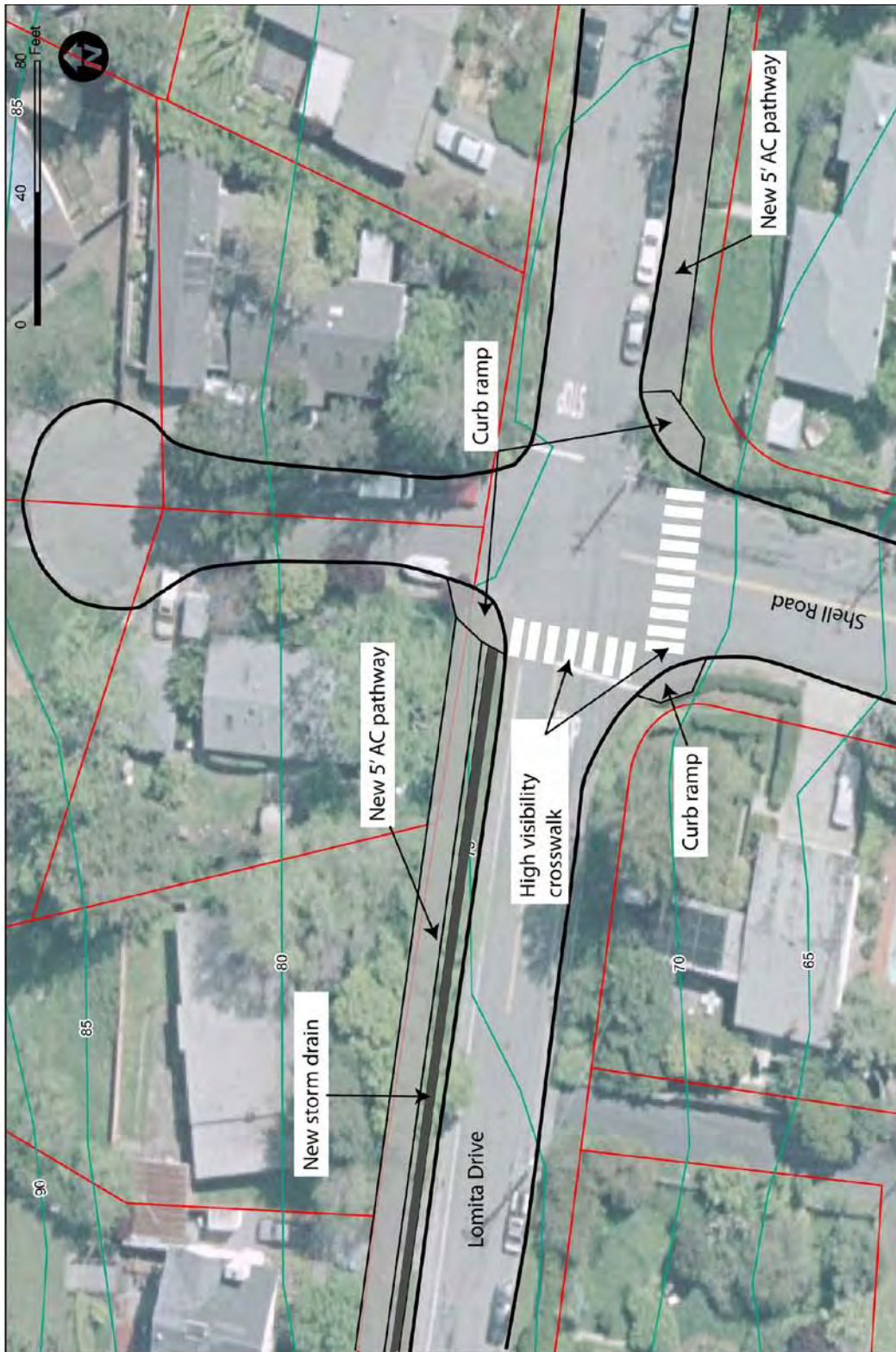


Figure 2-8: Plan view of Lomita/Shell intersection area

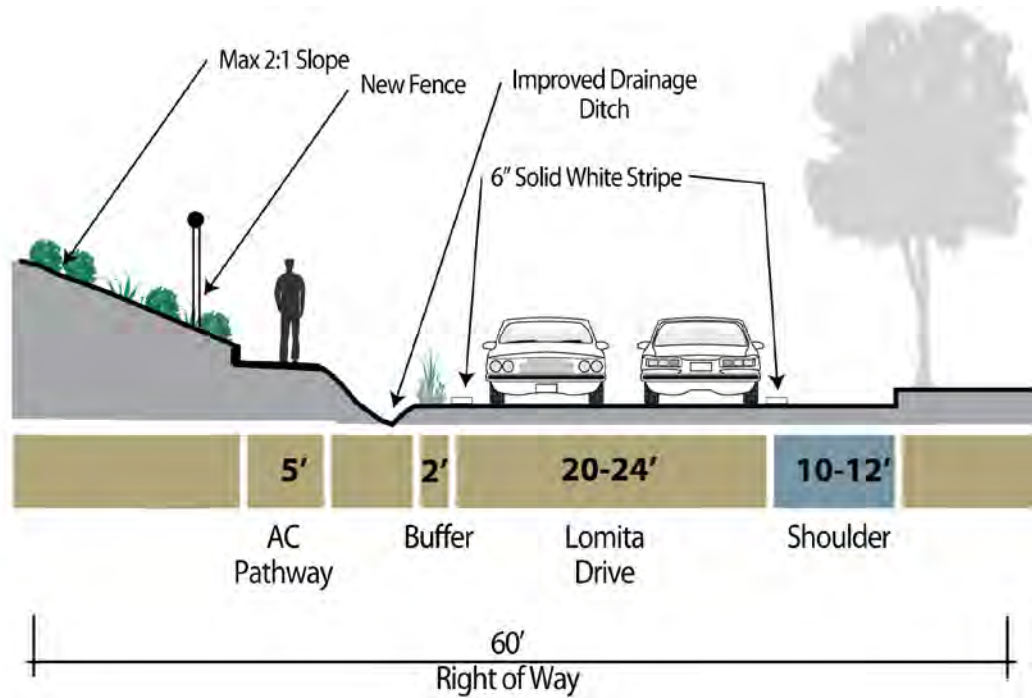


Figure 2-9: Section through Lomita Drive at open space frontage

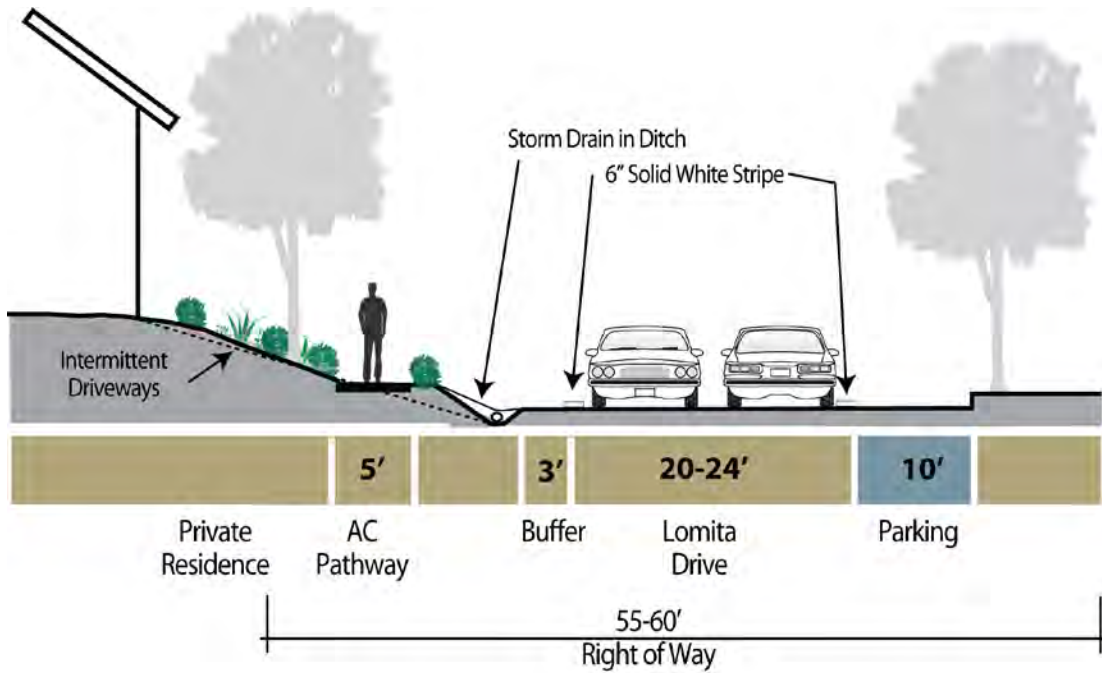


Figure 2-10: Section through Lomita Drive at residential frontage

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route

Segment 3 Improvement Concepts:

Class I bike path from end of Lomita Drive parallel to Highway 101 to Meadowsweet Drive, 2,040'/.4 miles; County bike route #5; Corte Madera jurisdiction, Caltrans right-of-way, maintained by Marin County Parks.

Issues:

- Bicycle access – path adjacent to freeway is noisy, exposed to glare from oncoming headlights at night. The segment includes two steep hills, approximately 10% and 8%. The connection to path from Meadowsweet requires a sharp hairpin turn.
- Emergency access – the path is too narrow to accommodate emergency vehicles.
- Pedestrian and ADA access – same issues as bicycle access.
- Impact on adjacent land use/permit process – the path is in the state right-of-way and any improvements will require Caltrans approval, and must avoid impact on freeway, and conform to current standards, or an exception must be justified.
- The potential for aerielly-deposited lead (ADL) on Caltrans right-of-way may need to be investigated.

Improvement Concepts:

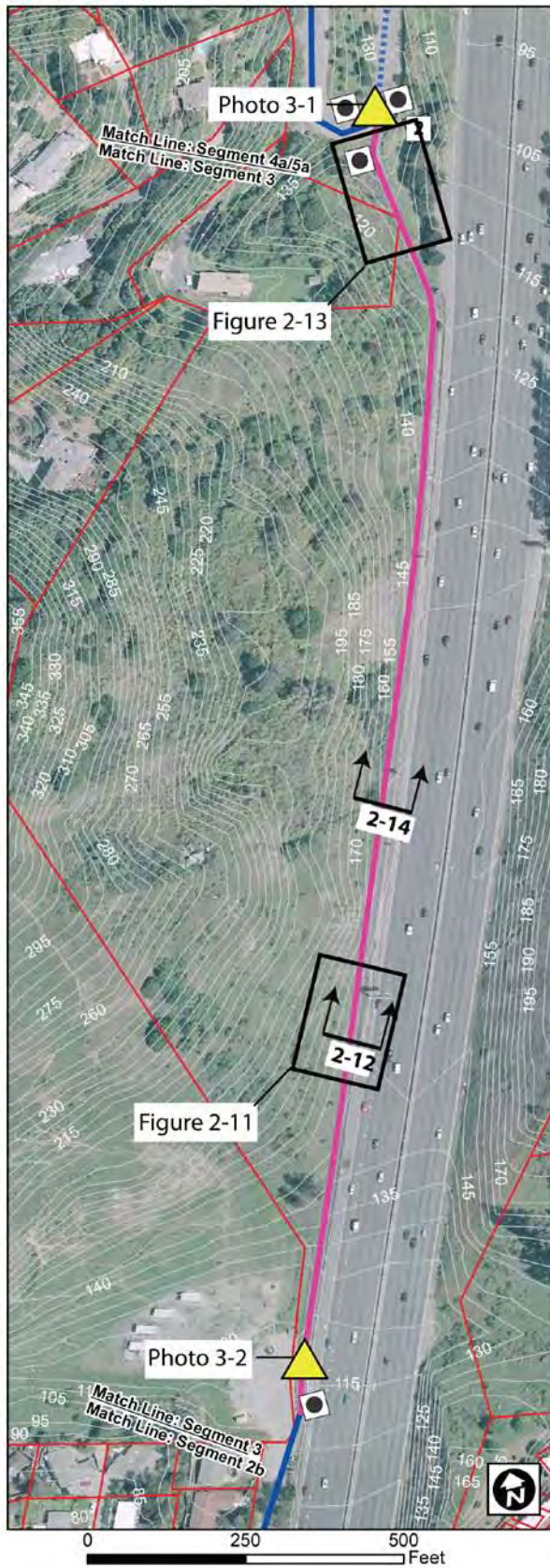
Widen the path to 12' to better accommodate bicyclists and pedestrians, as well as emergency vehicles, and provide a better separation between the freeway and the path for safety, function, and aesthetics (see Figure 2-11, 2-12). This segment is in the Caltrans right-of-way and improvements would require their review, approval, design standards and construction process. Key elements include:

- Demolish existing fence, guardrail, and pavement.
- Construct retaining walls where needed due to adjacent slopes down to freeway.
- Widen existing A.C. paved path to 12' with 2' shoulders.
- Install K-rail with baffles for headlight glare.
- Install vinyl-coated chain link fence (6').
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- Repaint path striping and marking.
- Some landscaping between the highway and the path may be feasible, but limited due to maintenance considerations, and because path visibility from highway is desirable to maintain for security purposes.
- Construct a connecting path from Meadowsweet to the north end of the Horse Hill Path to eliminate the hairpin turn that is currently necessary to make this connection (see Photo 3-1 and figure 2-13). With current conditions this connection and the path it connects to would have approximately 10% grade, and would not be ADA compliant, however a compliant 5% grade may be possible with the “sunken/raised” path alternative described in the following pages.



Photo 3-1 Potential location for connection from Meadowsweet to path.

Improvement Cost: \$2,300,000



Segment 3 Improvement Concepts

(see page 2-1 for Master Map Legend)



Photo 3-2 View north at Hwy 101 path near Horse Hill parking area

Segment Location Map



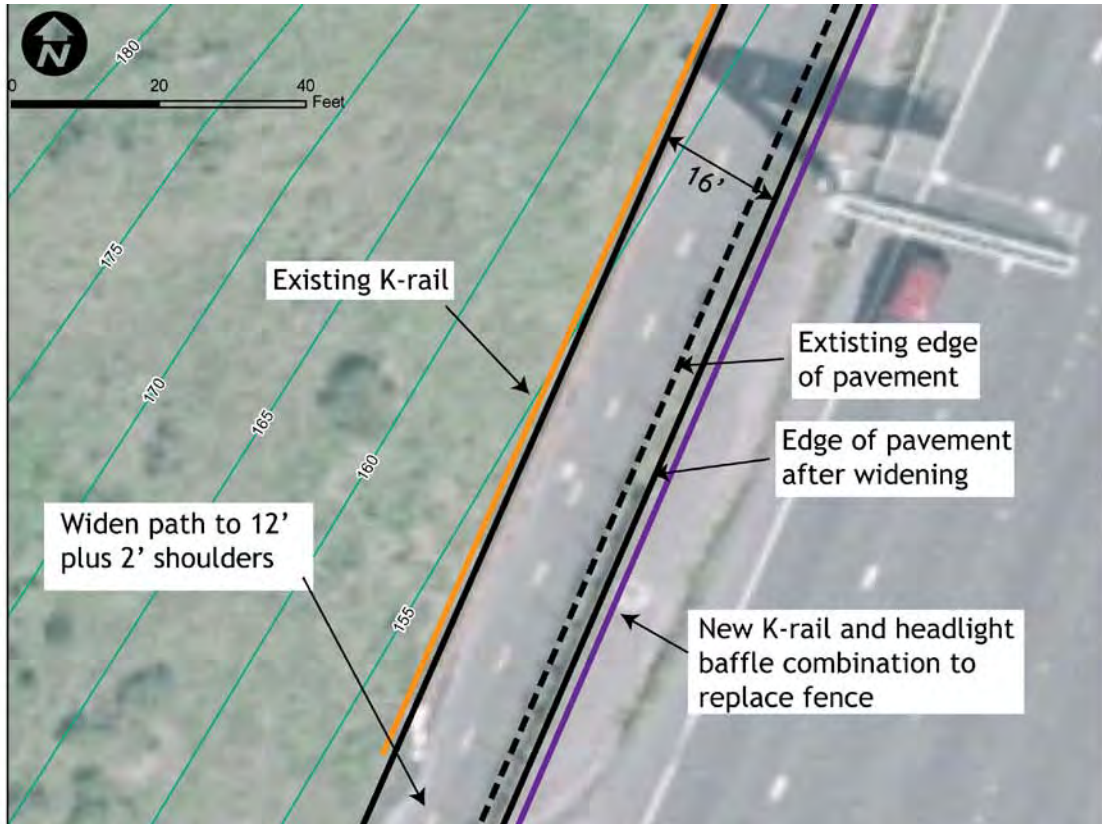


Figure 2-11: Plan of modified Horse Hill multi-use path

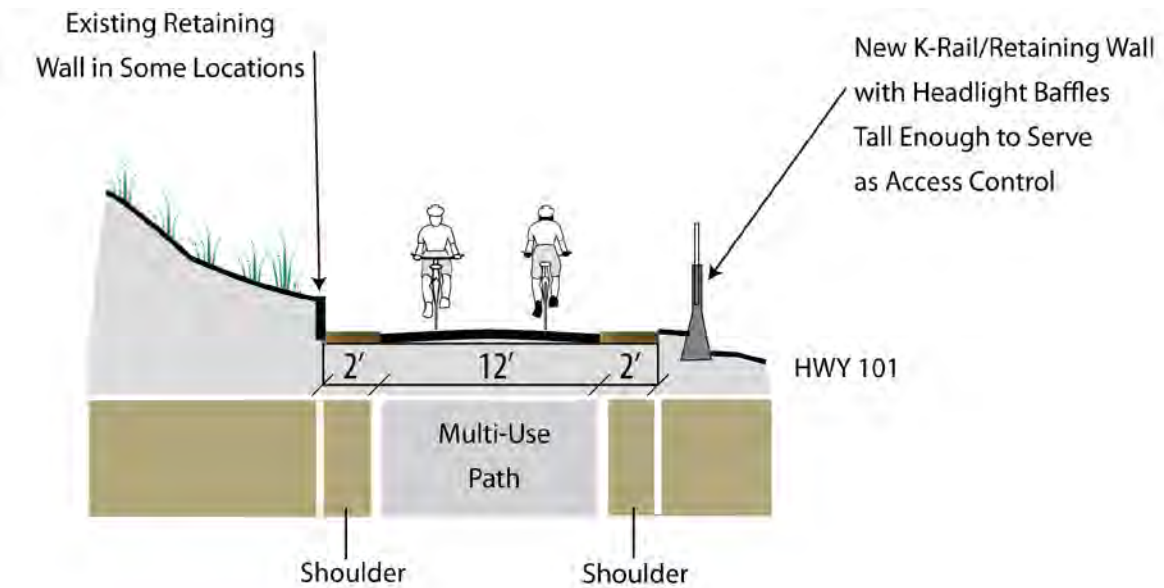


Figure 2-12: Cross-section through modified Horse Hill multi-use path

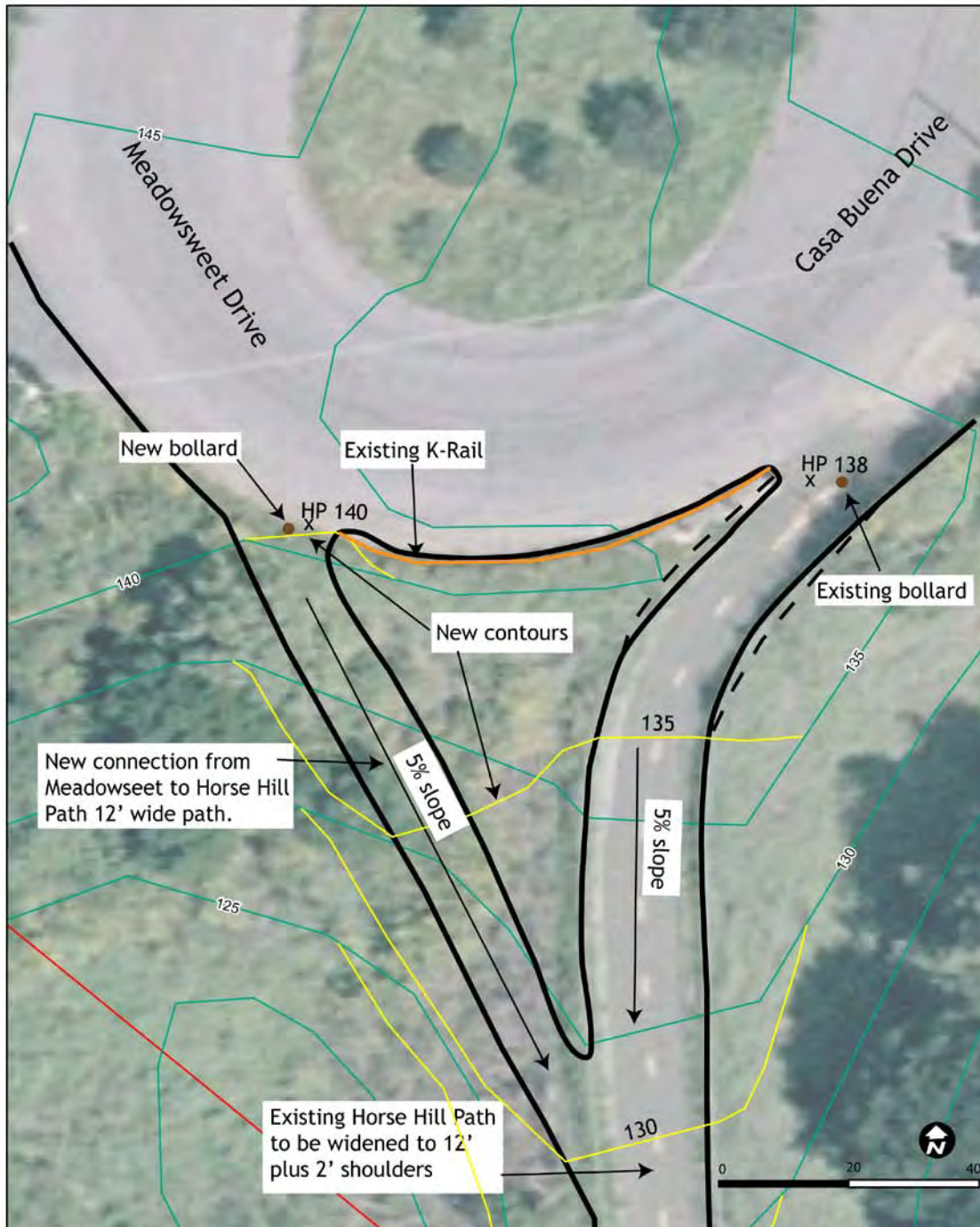


Figure 2-13: Conceptual plan of new path connection to Meadowsweet

Segment 3 Alternative: Sunken/Raised Path Concept

Public comments suggested that the Horse Hill Route should be improved in preference to the more expensive and intrusive opening of the Alto Tunnel. In addition to the improvements outlined above, the steep gradient and noise and glare impacts of the adjacent freeway on the Horse Hill route could be somewhat reduced by rebuilding part of this segment in a trench, as illustrated in Figure 2-14.

To slightly reduce the steep grades on this portion of the Horse Hill Route and separate the path from the freeway, a concept is presented for locating the trail in an open trench as deep as seven feet on the southern portion, and fill up to twelve feet deep on the northern portion, with corresponding walls the length of this segment (see Figure 2-15). This would require careful engineering, especially given the route's proximity to the freeway. The middle portion of the existing Horse Hill Path is up to 6' higher elevation than the adjacent freeway, so there would only be a significant wall on the west side of the path. Drainage would need to be carefully resolved, as the sunken path would tend to collect water from the adjacent hillside and freeway. Day-to-day and long-term maintenance cost for this alternative would be significantly higher than for a path on the surface. A steep (8%) hill would still remain on the route along Casa Buena.

Improvement Cost: \$6,980,000

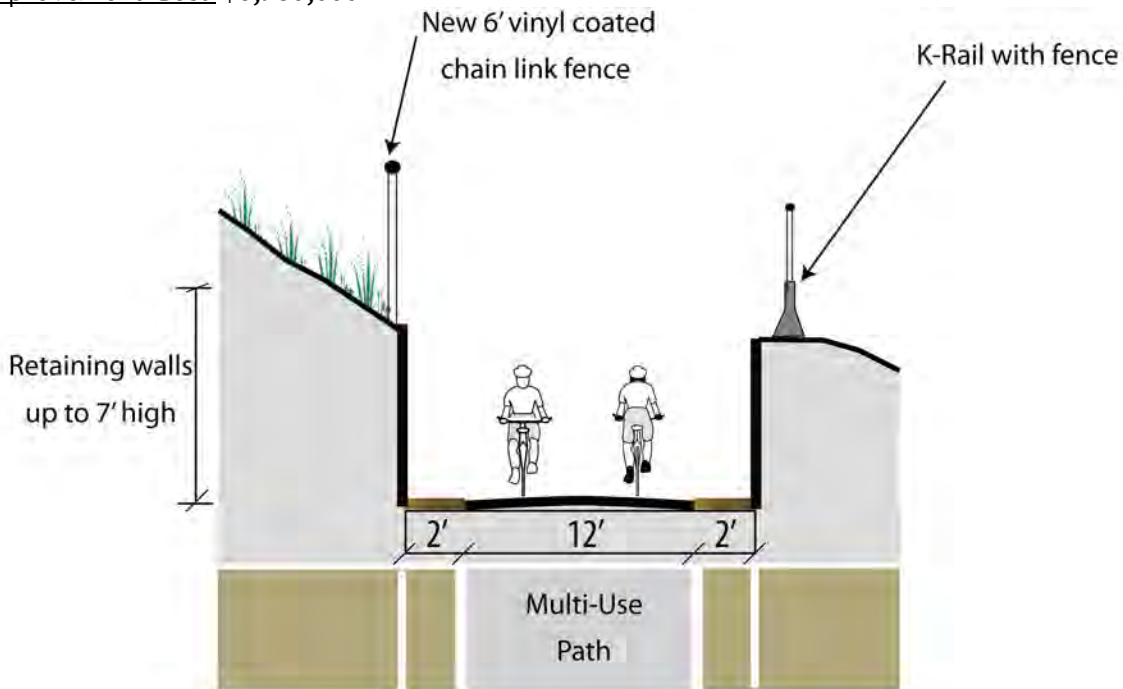


Figure 2-14: Segment 3 Alternative: Horse Hill Path with trench

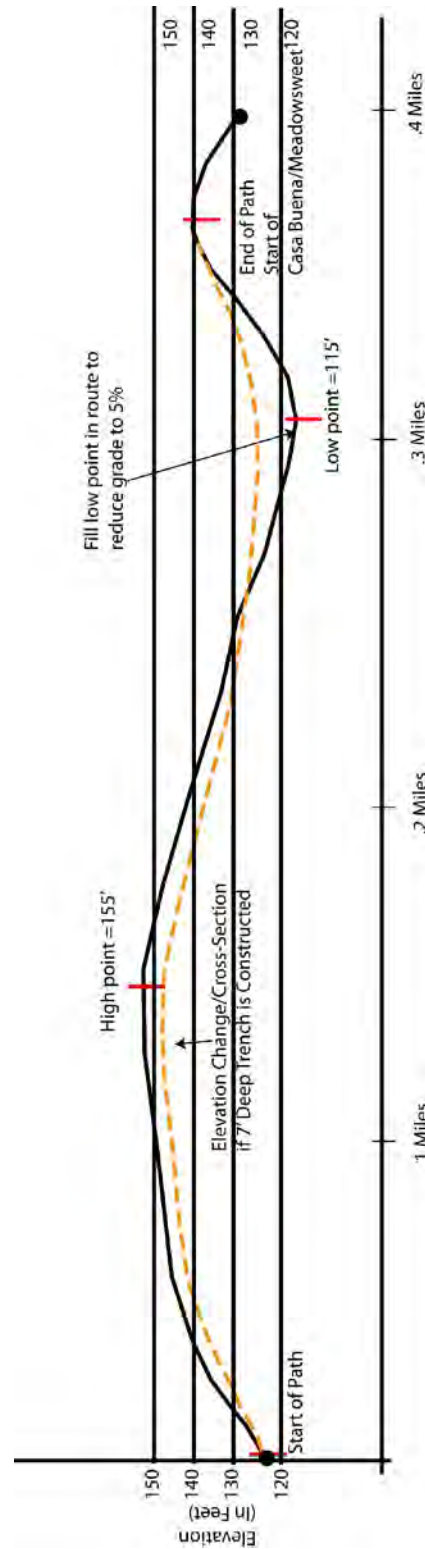


Figure 2-15: Profile of Horse Hill Path

DRAFT - Mill Valley to Corte Madera Bicycle and Pedestrian Corridor Study

Segment 4A South Improvement Concepts:

From northern end of the Horse Hill path along Meadowsweet Drive to the intersection with Conow Street; 4,270'/.8 miles; County bike route #5; Corte Madera jurisdiction/right-of-way.

Issues:

- Bicycle access – There are minimal paved shoulders for much of the route. The segment includes one steep hill. Meadowsweet is longer than the Casa Buena route. Visibility ahead is reduced on many corners.
- Pedestrian and persons with disabilities access – Most of the route has no sidewalk or path, and road shoulders are narrow. Route includes a steep hill (8%). Adding a sidewalk or path along the southern portion of Meadowsweet is assumed to be infeasible due to the steep terrain and adjacent residential development, and not warranted by the relatively low demand for pedestrian through access.
- Impact on/constraints from adjacent land use – Generally there is no available space to widen in this rural residential area without construction of retaining walls.

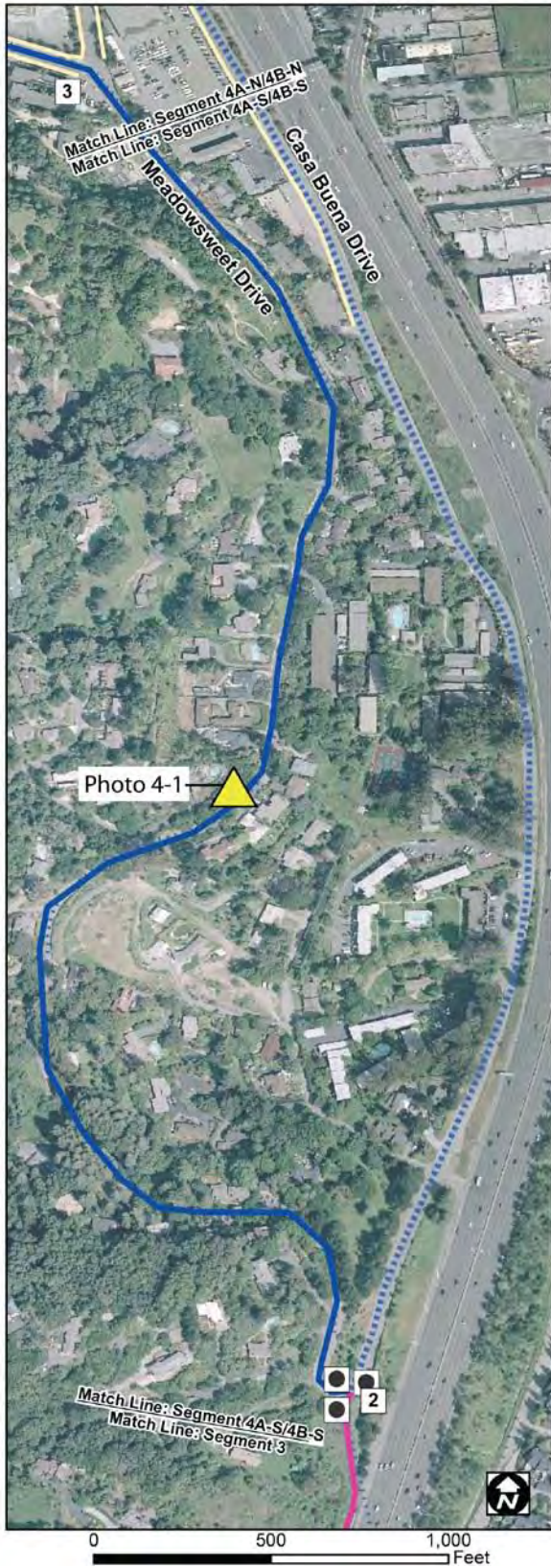
Improvement Concepts:

- Stripe street centerlines on curves.
- Stripe shoulders with white for better visibility.
- Add “sharrow” shared use lane markings.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Costs: **\$41,000**



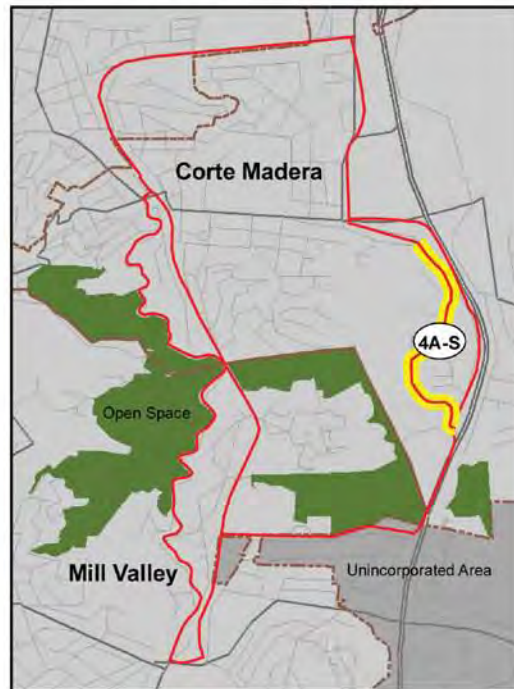
Photo 4-1 View south along Meadowsweet Drive.



Segment 4A South Improvement Concepts

(see page 2-1 for Master Map Legend)

Segment Location Map



Segment 4A North Improvement Concepts:

Meadowsweet Drive from the intersection with Conow Street to Sanford Street; 1,640'/.31 miles; County bike route #5; Corte Madera jurisdiction/right-of-way.

Issues:

- Impact on/constraints from adjacent land uses – A mixed multi-family residential area that backs up to commercial uses to the north. The pavement width is 36' with parking on both sides. There is not adequate width to stripe bike lanes, and widening of the roadway would require major improvements.

Improvement Concepts:

- Add “sharrow” shared use lane markings.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: **\$5,700**



Photo 4-1 View north along Meadowsweet Drive near intersection with Laurel Drive.



Segment 4A North Improvement Concepts
(see page 2-1 for Master Map Legend)

Segment Location Map



Segment 4B South Improvement Concepts:

Casa Buena Drive from northern end of Horse Hill path to Conow Street (a parallel alternative to Segment 4A South); 3,780'/.7 miles; Corte Madera jurisdiction/right-of-way.

Issues:

- Bicycle access – There are minimal paved shoulders for much of the route. The segment includes one steep hill (8%).
- Bicyclist travel – the freeway ramp intersection at Meadow Valley.
- Pedestrian and persons with disabilities access – Most of the route has no sidewalk or path, and road shoulders are narrow. Route includes a steep hill (8%). Continuing sidewalks or a pedestrian path past the generally steep and rural residential or open space areas would involve some significant expense and localized changes. Widening the shoulders along the southern portion of Casa Buena is assumed to be an adequate level of improvement for pedestrians on this portion of the route.
- Impact on adjacent land use/permit process – the segment is adjacent to the State right-of-way and any improvements must avoid impact on freeway, and conform to current standards, or an exception must be justified.
- The potential for aerielly-deposited lead (ADL) on Caltrans right-of-way may need to be investigated
- The pavement on this portion is 28' to 30' wide, with no on-street parking. The pavement would need to be extended another 2' to 4' to accommodate the bike lanes (see Figure 2-17). This would entail utilizing a portion of the approximately 5' wide vegetated area between the roadway and the existing fence. A portion of the roadway at the top of the hill south of Marin Joe's restaurant is 36' wide with parking on the west side.
- Casa Buena from Marin Joe's to Sanford Street is typically 32' wide, with parking on the east/south side. There is not adequate space for bike lanes, as curbside parking is currently used by adjacent businesses. About four additional feet of pavement could be created by utilizing most of the approximately 5' wide the vegetated area between the curb and the existing fence (see Figure 2-18), but this would not provide enough space to provide designated bike lanes unless the existing sidewalk was reconstructed to provide an additional 2 feet of width. The GIS right-of-way information available for the Study is not detailed enough to determine if additional right-of-way would be needed. Casa Buena is adjacent to Highway 101, so this widening could entail Caltrans approval and may entail improvement requirement, such as a K-rail barrier.

Improvement Concepts:

- Investigate whether STOP sign traffic control would be warranted for installation at Casa Buena Drive's intersection with the on-ramp to southbound US 101 Meadow Valley to reduce conflicts between northbound bicyclists and southbound vehicles turning left onto the US 101 on-ramp (see Figure 2-14).
- Improve Shoulders. Extend the paved shoulders on the southern portion of Casa Buena.
- Sign and designate the segment as a Class III bike route.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: **\$1,160,000**



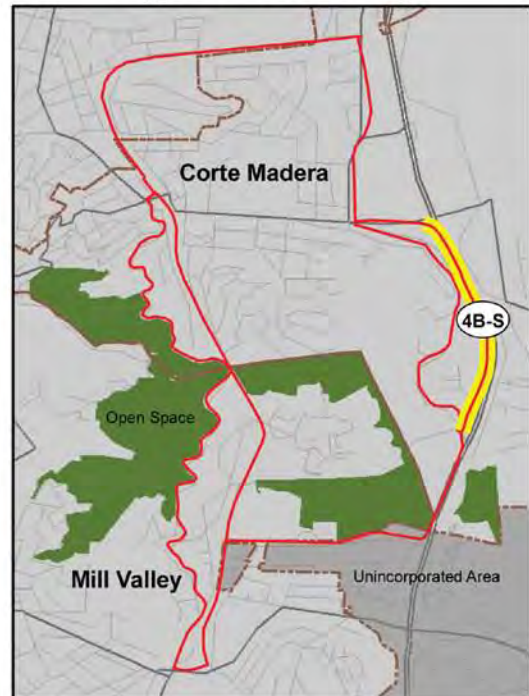
Segment 4B South Improvement Concepts

(see page 2-1 for Master Map Legend)



Photo 4-2 View north along Casa Buena Drive.

Segment Location Map



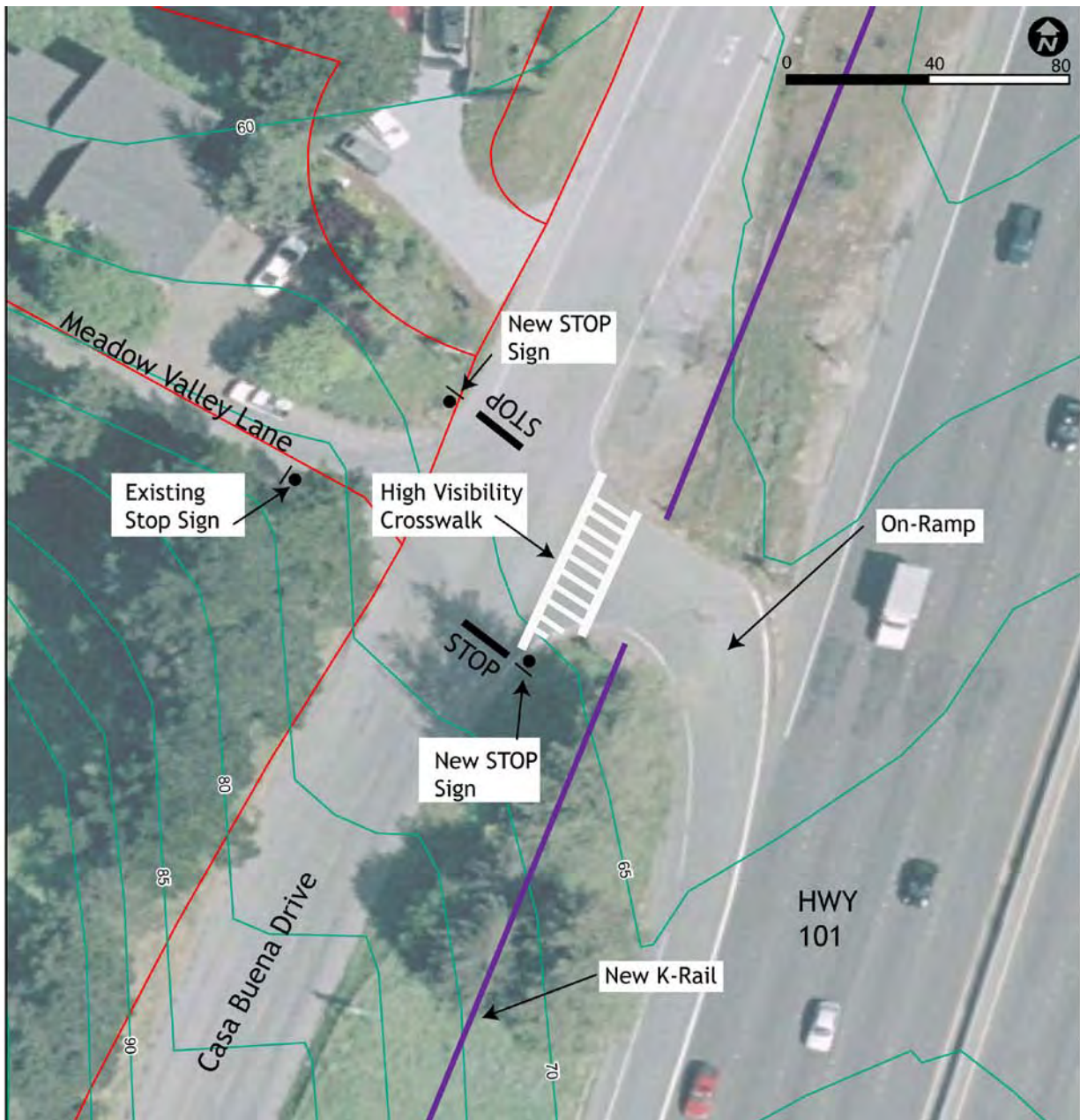


Figure 2-16 Highway 101 on-ramp intersection improvements

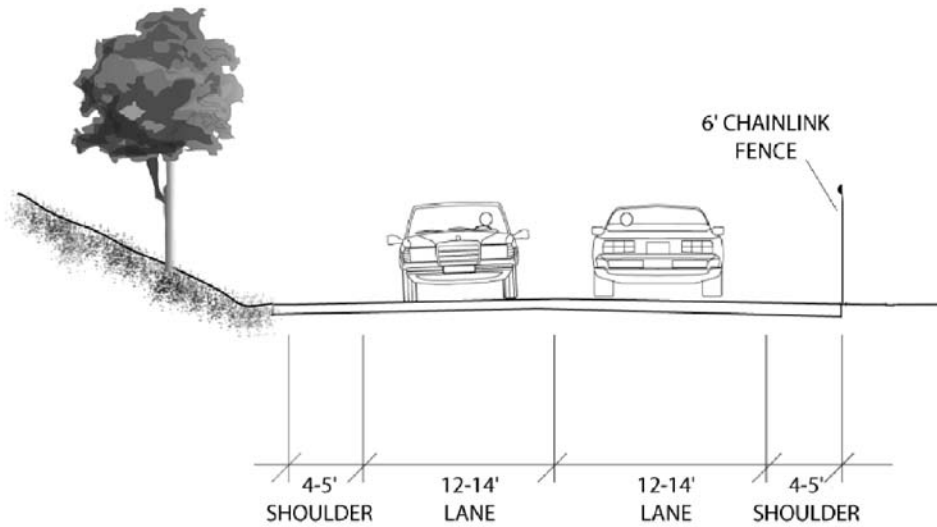


Figure 2-17: Existing condition - section through southern portion of Casa Buena

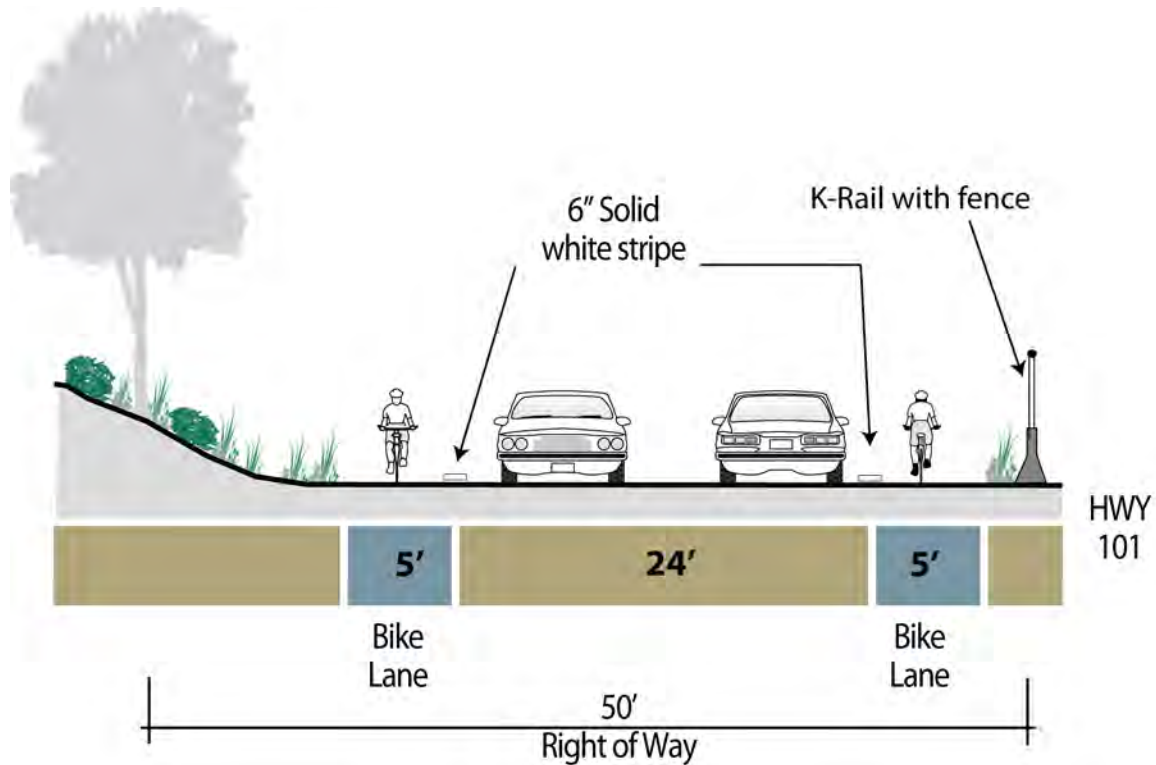


Figure 2-18: Proposed condition - section through southern portion of Casa Buena

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route

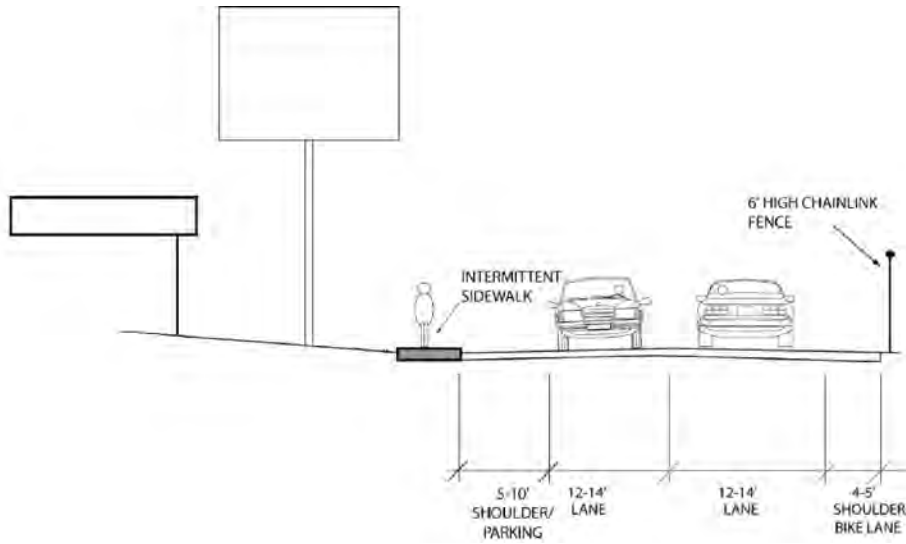


Figure 2-19: Existing condition - Section through northern portion of Casa Buena

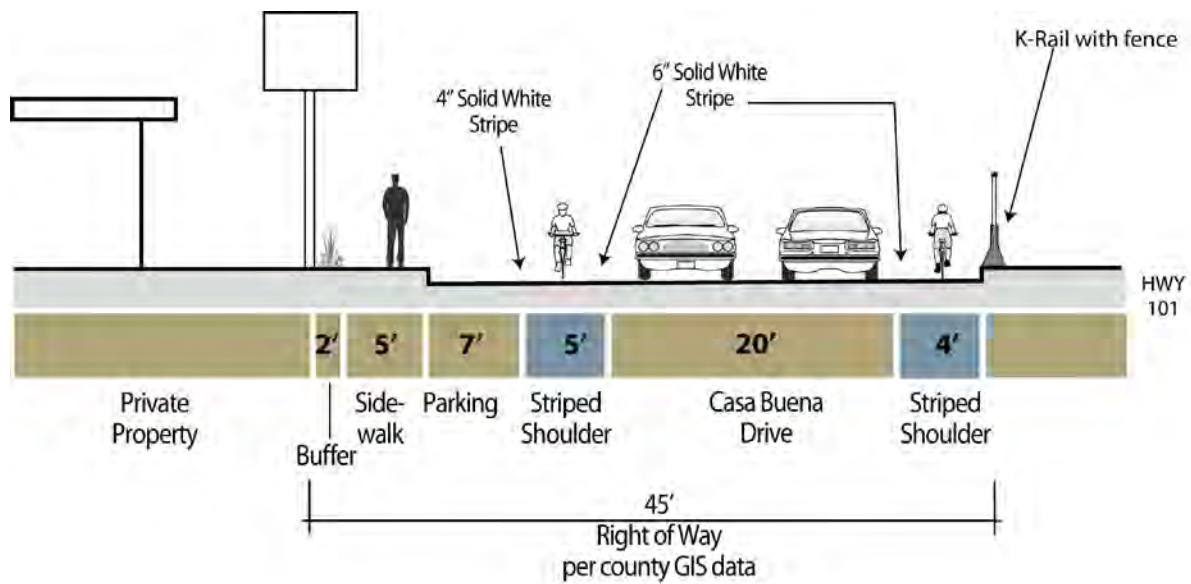


Figure 2-20: Proposed condition - section through northern portion of Casa Buena

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route

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Segment 4B North Improvement Concepts:

Casa Buena Drive from Conow Street to Sanford Street at Tamalpais Drive (a parallel alternative to Segment 4A North); 1,890'/.4 miles; Corte Madera jurisdiction/right-of-way.

Issues:

- Bicycle access –Pavement width is adequate from Conow Street to Sanford Street to provide bike lanes. The Town of Corte Madera recently striped bike lanes on the eastern portion of this segment. There is curb side parking only on the south. As discussed in more detail under Segment 4A North, for southbound bicyclists and pedestrians it would be preferable to use Meadowsweet rather than Casa Buena.
- Impact on adjacent land use/permit process – the segment is adjacent to the state right-of-way and any improvements must avoid impact on freeway.
- The potential for aerially-deposited lead (ADL) on Caltrans right-of-way may need to be investigated

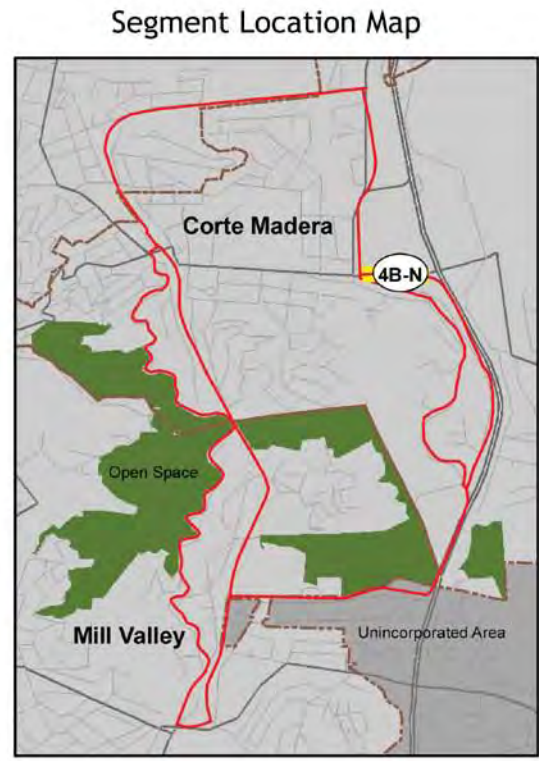
Improvement Concepts:

- Stripe, sign and designate the remainder of the segment as a Class II bike route.
- Additional crosswalk warning signs, route wayfinding signs, and milepost signs.

Improvement Costs: **\$31,000**



Segment 4B North Improvement Concepts
(see page 2-1 for Master Map Legend)



Segment 5 Improvement Concepts:

Sanford Street from Meadowsweet Drive to Tamalpais Drive, 60 feet/.01 miles, County bike route #5. Corte Madera jurisdiction/right-of-way. Corte Madera jurisdiction/right-of-way.

This area is under concurrent study by the Transportation Authority of Marin as part of the Highway 101 Greenbrae/Twin Cities Corridor Improvements Study. Figure 2-21 shows conceptual improvements from that study.

Issues:

- Bicyclist access – The tight intersection of Sanford, Casa Buena, and Meadowsweet is challenging for traffic movements and for bicyclists and pedestrians to navigate due to the multiple yields and lack of crosswalks. Using Casa Buena is preferred for northbound bicyclists and pedestrians because they don't have to traverse the portion of this intersection where southbound cars are turning left onto Casa Buena from Sanford. Conversely, southbound bicyclists and pedestrians would be safer using Meadowsweet rather than Casa Buena.

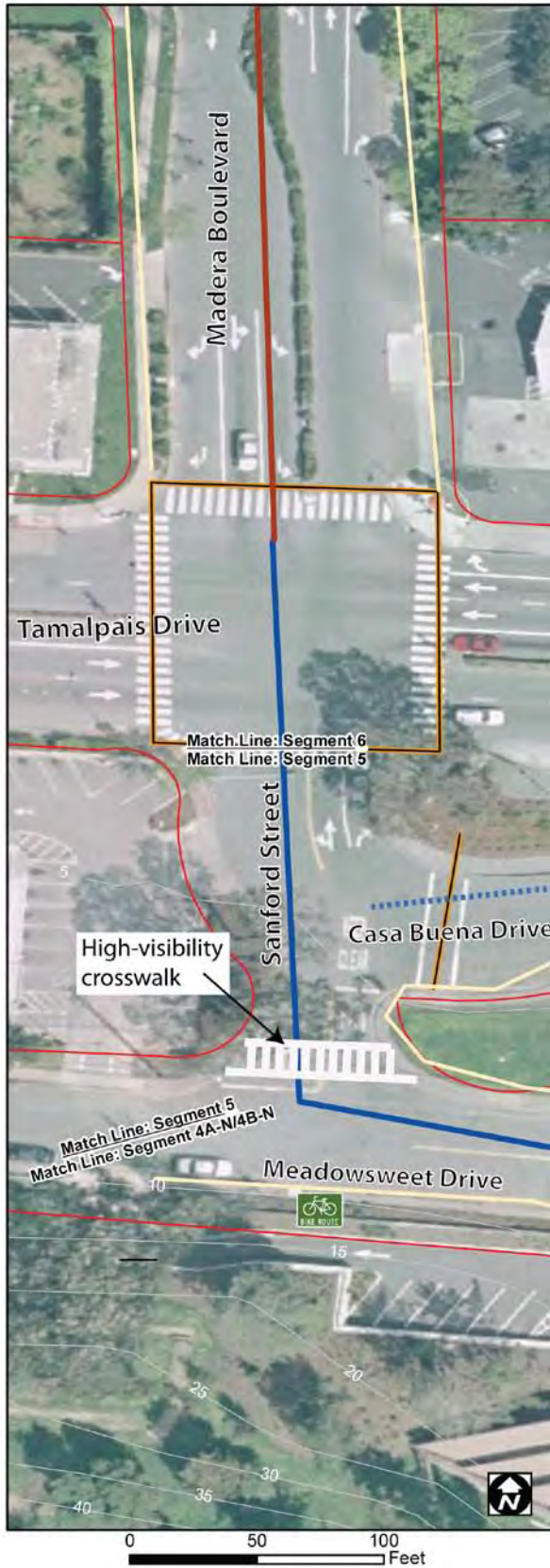
Improvement Concepts:

- Minor curb, gutter and sidewalk reconstruction within the existing right-of-way to provide clearance for bike lanes along Sanford Street.
- Provide a crosswalk on north side of Meadowsweet at Sanford.
- Add bike detector loops to signals.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Costs: See Segment 6 - estimated in TAM Highway 101 Greenbrae/Twin Cities Corridor Improvements Study

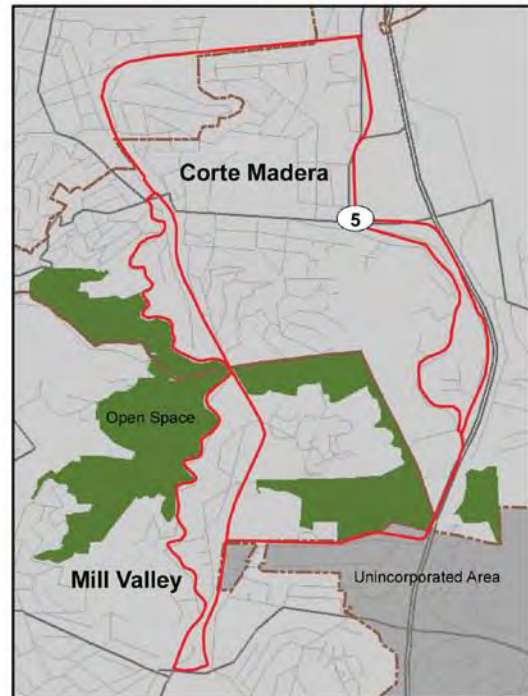


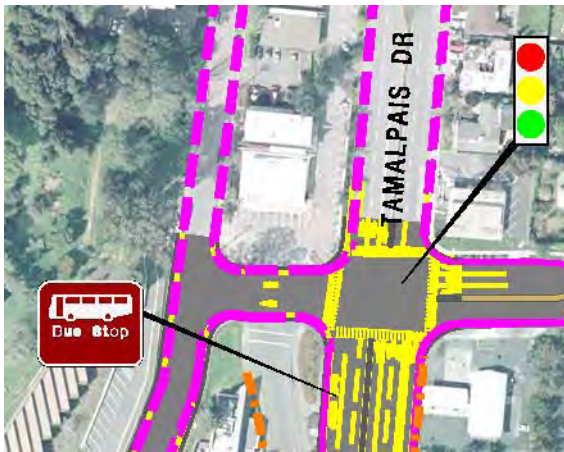
Photo 4-3 View north from Meadowsweet across Sanford Street and Tamalpais Drive.



Segment 5 Improvement Concepts

Segment Location Map





Detail of Sanford Street intersection improvements (north is at top)

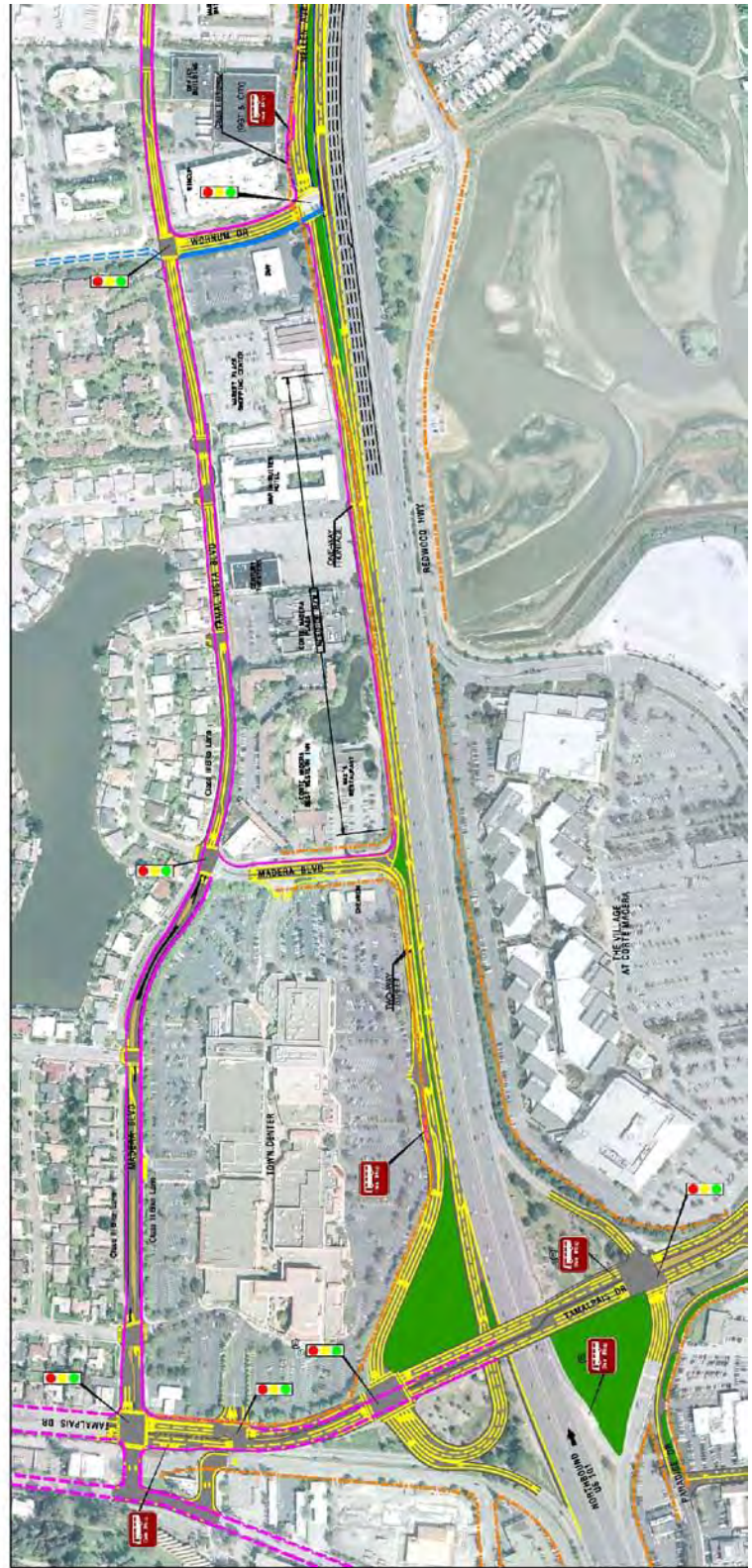
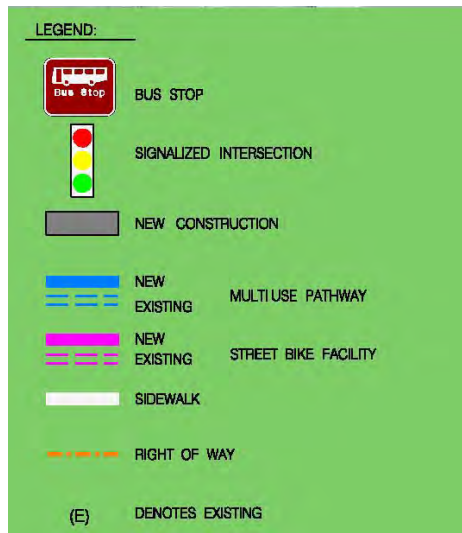


Figure 2-21: Greenbrae/Twin Cities Corridor Improvements Study

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Segment 6 Improvement Concepts:

From Tamalpais Drive to Wornum Way along Madera Boulevard and Tamal Vista Boulevard to the study end point; 3,620'/.69 miles, County bike route #5; Corte Madera jurisdiction/right-of-way.

This area is addressed by a concurrent study by the Transportation Authority of Marin – the Highway 101 Greenbrae/Twin Cities Corridor Improvements Study.

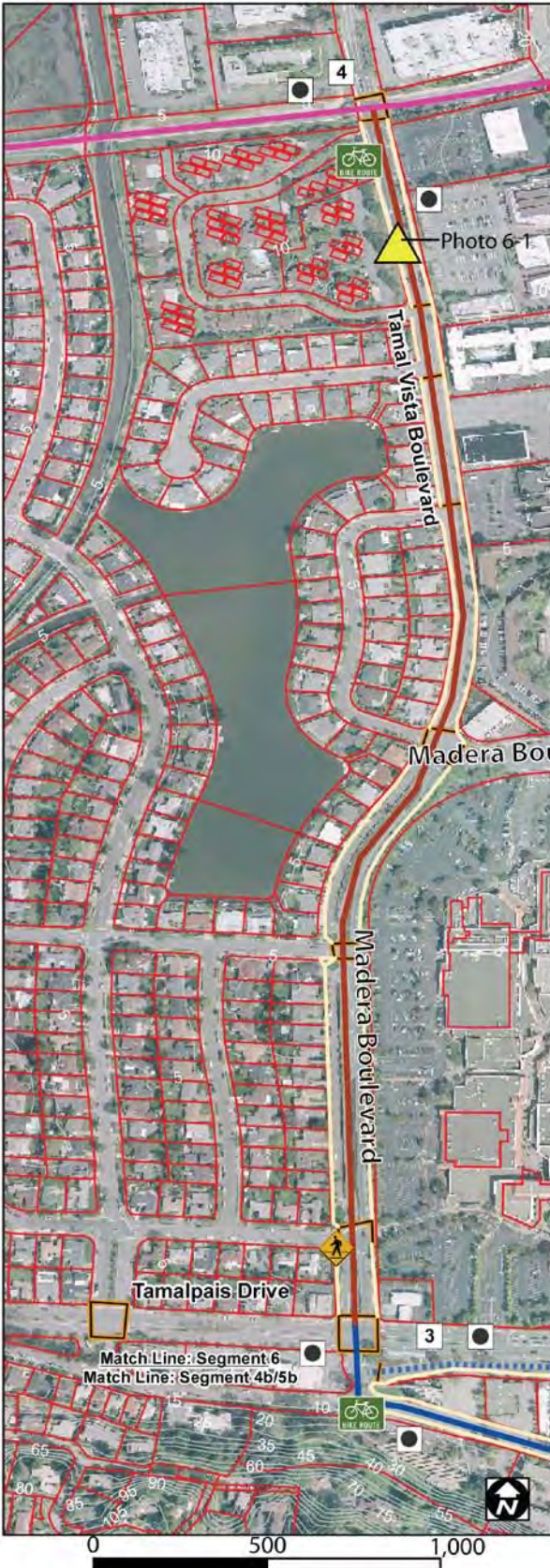
Issues:

- Bicycle access – Currently bike lanes exist on Madera Boulevard from Tamalpais Drive to where Madera turns to the east, but they end at Tamal Vista north of the Town Center shopping area.
- Sidewalk upgrades may be needed to meet current standards.

Improvement Concepts:

- Reconfigure Madera Boulevard's intersection with Tamalpais Drive to improve channelization and provide simultaneous north-south traffic signal phases.
- Stripe and sign for Class II bike lanes from Tamal Vista north.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- Potential future ADA upgrades to sidewalks and driveways (not in current project cost).

Improvement Costs: **\$434,000** per Jacobs Associates estimate prepared for the Highway 101 Greenbrae/Twin Cities Corridor Improvements Study – includes improvements cost for segment 5, Sanford Street.



Segment 6 Concept Improvements
(see page 2-1 for Master Map Legend)



Photo 6-1 View north along Tamal Vista Blvd.

Segment Location Map



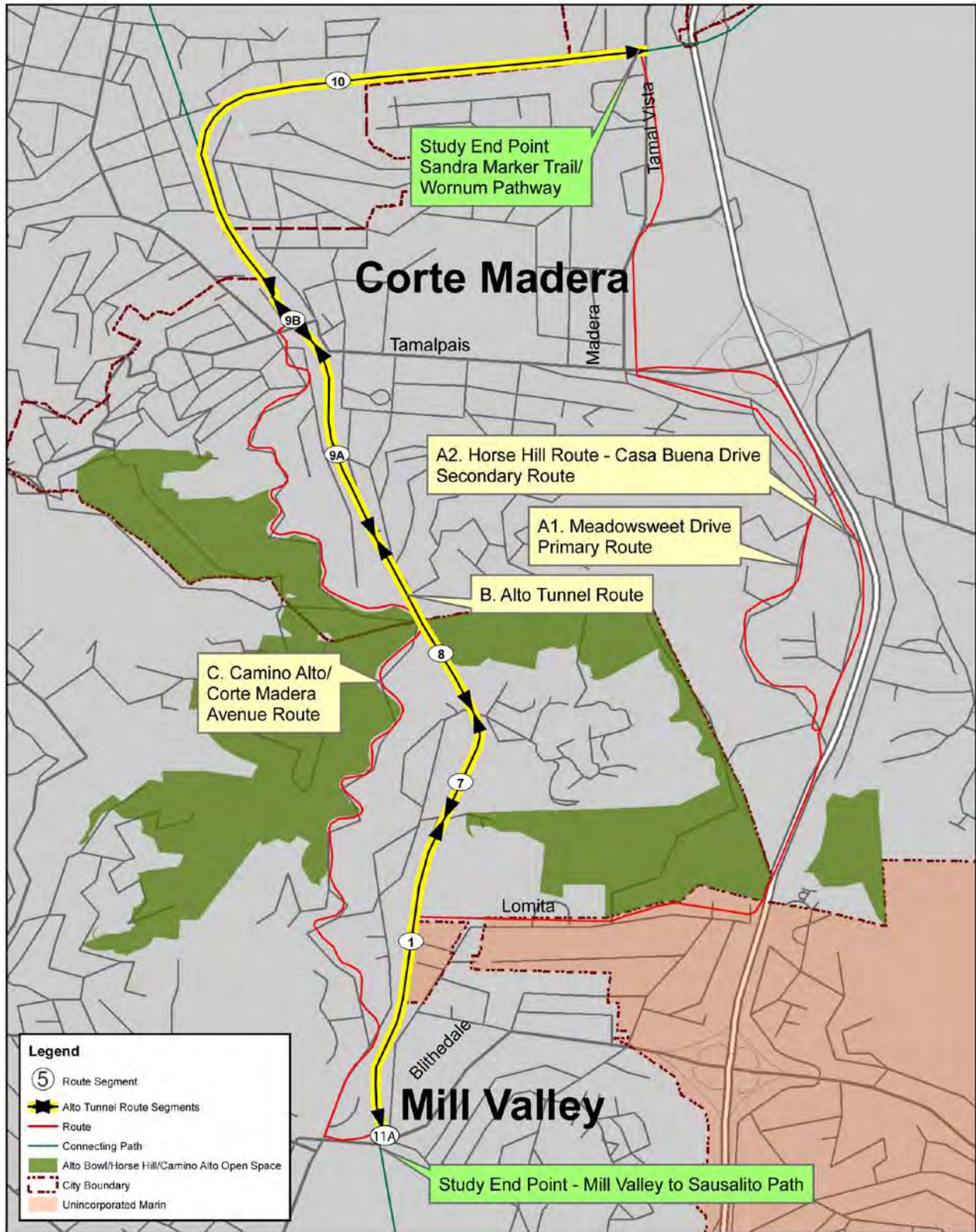


Figure 2-22: Alto Tunnel Route Overview

Route Alternative B - Alto Tunnel Route

Overview:

The Alto Tunnel Route is the most technically challenging of the three alternative routes. The southern portion of the route is an existing Class I path built on the railroad right-of-way leading to the Alto Tunnel. This portion is shared with the Horse Hill Route. Beyond Vasco Court the path continues as an informal unpaved route that terminates in dense brush prior to the tunnel. The tunnel itself is a partially collapsed and filled former rail tunnel with a deteriorating wood support structure. North of the tunnel, the former rail line is overgrown with an informal path, but more accessible than the south portal. This transitions to a wide, well-used gravel path, and finally to a wide sidewalk near Tamalpais Drive, passing through the downtown area of Corte Madera. The bicycle and pedestrian connection to the south end of the existing Sandra Marker Trail north of Redwood Avenue follows Montecito Drive, a residential connector street that has perpendicular parking on the east side.

This route consists of six major segments:

Segment 11A: Crossing improvements on East Blithedale Avenue at Lomita Road, at the northern end of Mill Valley Sausalito Path.

Segment 1: Functions as part of Alto Tunnel & Horse Hill route. From the northern end of Mill Valley-Sausalito Path to Vasco Court.

Segment 7: Old railroad bed from Vasco Court to Alto Tunnel.

Segment 8: Alto Tunnel.

Segment 9: From northern end of Alto Tunnel to Redwood Avenue at Montecito Drive (has North and South sub-segments – 9A and 9B).

Segment 10: Connection along Montecito Drive north of Redwood Avenue to the existing Sandra Marker Trail, and along the existing Sandra Marker Trail from Tamalpais Drive north and east to Wornum Way at Tamal Vista Ave.

Total length is 6,620 feet/3.1 miles

Issues:

Ability to reconstruct the tunnel to provide a safe structure. Modern tunnel engineering and construction techniques can provide a structurally safe tunnel. Rehabilitation of the tunnel to provide bicycle and pedestrian access would stabilize the tunnel.

Tunnel rehabilitation impacts. Adjacent property owners have concerns about construction activities. The concerns are associated with ground vibration, settlement, potential instability, noise, dust, traffic, and other typical construction impacts. The Tunnel Feasibility Analysis indicates that excavation of the existing backfill concrete plug in the tunnel would not require blasting. Excavation could be performed by roadheader or hydraulic hammer, which would either scrape or chip the concrete away in a controlled manner, with minimal vibration felt at the ground surface. Excavated materials can be handled by traditional earth moving equipment (e.g., buck loaders), or in the case of a roadheader, by an apron loader that transfers muck onto a short conveyor. The roadheader conveyor dumps the material into muck cars or haul trucks for transport out of the tunnel. The

entire roadheader cutter, boom, frame, apron, and conveyor assemblies are usually mounted on either crawler tracks or rubber tires for propulsion. To address concerns of settlement and stability during construction, building protection measures are possible for residential structures above the tunnel alignment in the portal areas that are within the zone of influence of tunnel rehabilitation activities. Such potential protection measures include structural underpinning, grouting, ground reinforcement, and other measures to protect surface structures from ground movement associated with construction. Geotechnical instrumentation and monitoring can be implemented to monitor ground and structure movements and to verify that building protection measures are working effectively. Ground movement threshold limits can be set to trigger additional remedial measures to prevent damage to structures above the tunnel. This is a pro-active approach to protect surface structures and prevent damage before it occurs, and such protective and monitoring measures are included in the cost estimate.

Native trees and vegetation within the rail corridor. Construction of a multi-use path, along with a 20' wide emergency access corridor, and parking/turnarounds for emergency vehicles near the tunnel portals, would require removal of native trees and shrubs that have grown in the corridor since rail use was discontinued. In addition there may be visual changes to the rural and wooded character of the route. These issues could be minimized and addressed through careful design.

Right-of-way ownership for the tunnel and rail line. Parcels on the route are in a variety of ownerships. These issues are discussed in more detail in the Right-of-Way Conditions Analysis. A scope and budget to fully evaluate the property records and ownership issues is provided in the cost estimate.

Use levels and impacts. The Use Counts and Projections Study estimates that approximately 2,330 bicyclists and pedestrians per day would use the Alto Tunnel Route if it were improved as envisioned. Specific concerns raised by neighboring property owners include security, privacy, and noise. Particular concern was expressed regarding the safety and security impacts on the adjacent Maguire Elementary school campus. The study includes improvement and operation concepts to address security and safety, modeled after specific measures and agreements developed for the Cal Park Tunnel multi-use path project, and refined with input from local emergency services and maintenance staff.

Safety for users. The 2,172 foot tunnel presents concerns for user comfort and safety, and for maintenance and emergency services response. The tunnel has a slight curve, so users will not be able to see the entire length of the tunnel. The tunnel is not wide enough to accommodate conventional emergency response vehicles, such as an ambulance or fire truck. The Cal Park Tunnel multi-use path project provides a model of the specific potential solutions for these issues. Specific issues and solutions are analyzed and addressed in the Emergency Response Analysis and the Tunnel Feasibility Analysis, and summarized in this improvement concepts section.

Conflict with traffic. If the Alto Tunnel is opened, the volume of bicyclists and pedestrians would require at least minor improvements to the East Blithedale/Lomita Avenue intersection. A separated crossing of East Blithedale for bicyclists and pedestrians may be desirable.

Moving the large projected volumes of bicycle and pedestrian users associated with the potential reopening of the Alto Tunnel through downtown Corte Madera will also involve careful examination and improvement of existing path, road, parking and landscape improvements.

Drainage. Seasonally wet areas are located at both portals of the Alto Tunnel, and water apparently draining from the tunnel at the south end. The Drainage Analysis investigated the sources of this water, and identified conceptual solutions, which are detailed in the Improvement Concepts.

Cultural Resources. The Alto Tunnel alignment and vicinity is sensitive for both archaeological and historic resources. Archaeological and historic resources have been mapped in the project area.

Segment 11A Improvement Concepts:

From the northern end of Mill Valley-Sausalito Path across East Blithedale Avenue and along East Blithedale to Camino Alto (serves Horse Hill, Alto Tunnel, and Camino Alto/Corte Madera Avenue routes); Mill Valley jurisdiction and right-of-way.

Shared with Horse Hill Route – see prior section for map and description

Segment 1 Improvement Concepts:

Functions as part of Alto Tunnel & Horse Hill route. From the northern end of Mill Valley-Sausalito Path to Vasco Court; 3,590 feet/0.68 miles; part is County bike route #5.

Shared with Horse Hill Route – see prior section for map and description

Segment 7 Improvement Concepts:

Old railroad bed running from Vasco Court to Alto Tunnel portal; 1,280'/.24 miles; Mill Valley jurisdiction, owned by Marin County.

Issues:

- Adjacent land use – Public comments included concerns about construction of the path and tunnel, and the addition of large volumes of bicyclists and pedestrians, on the adjacent residential neighborhoods and Edna Maguire Elementary School campus.
- Native trees and vegetation – Mature native trees and shrubs have grown in the approaches to both tunnel portals. Construction of an improved multi-use path and emergency vehicle access will require trimming and some tree removal.
- Emergency and maintenance access – the long approaches along the rail corridor, and the long, narrow tunnel, present access and staging challenges. Mill Valley and Corte Madera emergency services staff have reviewed and commented on the conditions and improvement concepts for the tunnel. At this stage of study, they have requested an evaluation of a 20' emergency access corridor. This would be further reviewed in the environmental review, right-of-way analysis, and final design stage of any project undertaken.
- Drainage – The tunnel portals areas both have standing water during wet conditions, and the tunnel itself is expected to be wet due to surface runoff and/or groundwater. The tunnel would need a subsurface path drain that connects into the drainage improvements outside the portal. The original ditches that drained the railroad grade have become partially filled and clogged with vegetation. At the south portal area, the majority of off-site runoff is separated from the path area and has its own conveyance to the Sutton Manor Branch Creek. A minor amount of off-site runoff, approximately 2 acres, flows to the path alignment from residential areas. The fill of any waters of the U.S. or State would trigger regulatory agency permitting and mitigation requirements.



Photo 7-1 View north along old RR bed

- Bicycle and pedestrian access, conflicts – Ultimately separate bike and pedestrian facilities would be preferred due to the broad range of user types on the path. Transitions to existing pathway segments that are not separated, and to the combined path in the tunnel, would need to be carefully resolved. The separate path configuration requires more vegetation removal than a combined path, but a 20' wide emergency access corridor could also require vegetation removal.
- The Alto Tunnel alignment and vicinity is sensitive for both archaeological and historic resources.

Improvement Concepts:

- Add high visibility crosswalk and curb ramps on Vasco Court, bollards and stop signs on the adjacent trail, and crossing warning signs on the street.
- Clear and trim existing vegetation. Types and estimated quantities are detailed in the Environmental Considerations Study. A 20' wide clear corridor to the tunnel is included.
- Remove rails and salvage to permit path construction.
- Construct A.C. paved paths – 10' wide for bikes with 2'shoulders, 8' wide for pedestrians (see Figure 2-23).
- Construct emergency vehicle parking and turn-around as illustrated in Figures 2-24 and 2-25, near the tunnel portal. Retaining walls would be required.
- Provide fire hydrants (1,000 GPM) at portal side of emergency access turnarounds.
- Extend water line for fire hydrant at turnaround, and up to tunnel portal for connection to wet-standpipe system in tunnel. A 10" water line was required for the Cal Park Tunnel.
- Install bollards to restrict unauthorized vehicle entry (location TBD between path entry and tunnel portal).
- Construct drainage improvements as detailed in the Drainage Analysis, including:
 - Improve and relocate drainage swale on west side of path. This may be designed as a vegetated swale to minimize habitat loss.
 - A drainage culvert under the path to the east to connect to Sutton Manor Branch Creek, which flows to the east.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: **\$1,380,000**

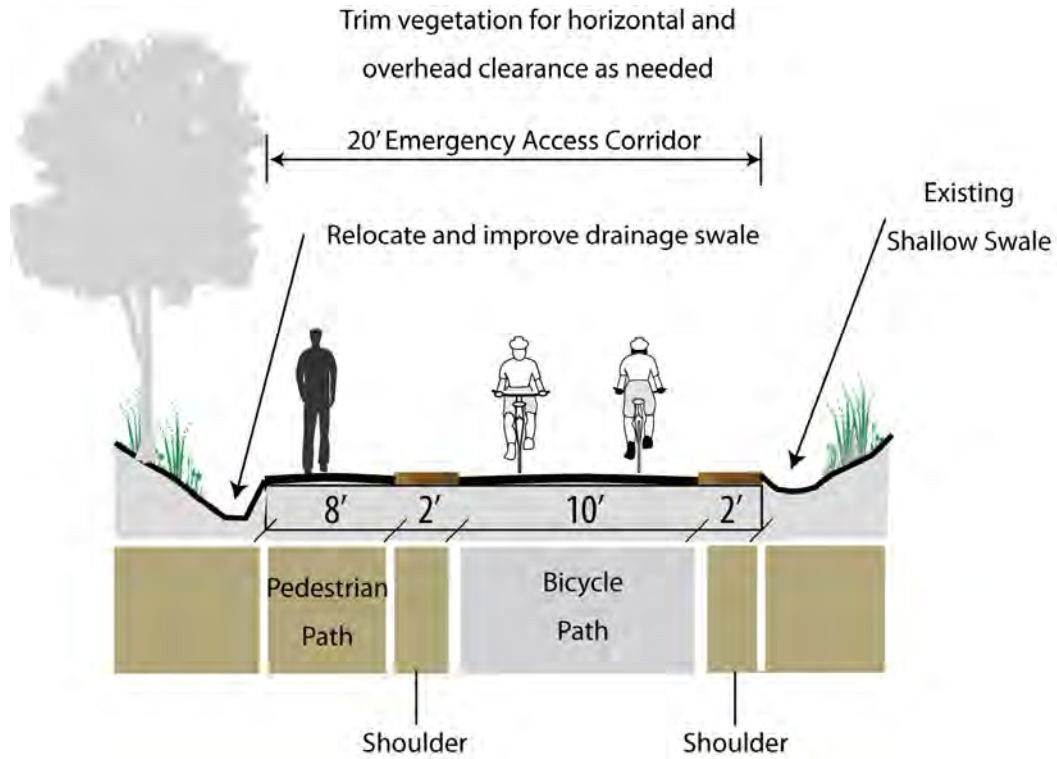


Figure 2-23: Section through Multi-Use Path



Segment 7 Improvement Concepts

Emergency Turnaround Detail see Fig 2-24 and 2-25

Segment Location Map

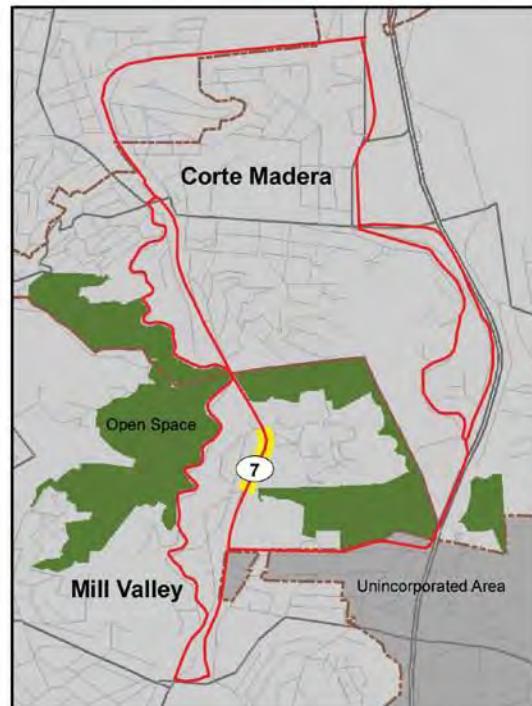




Figure 2-24: South Portal Emergency Vehicle Turnaround Plan

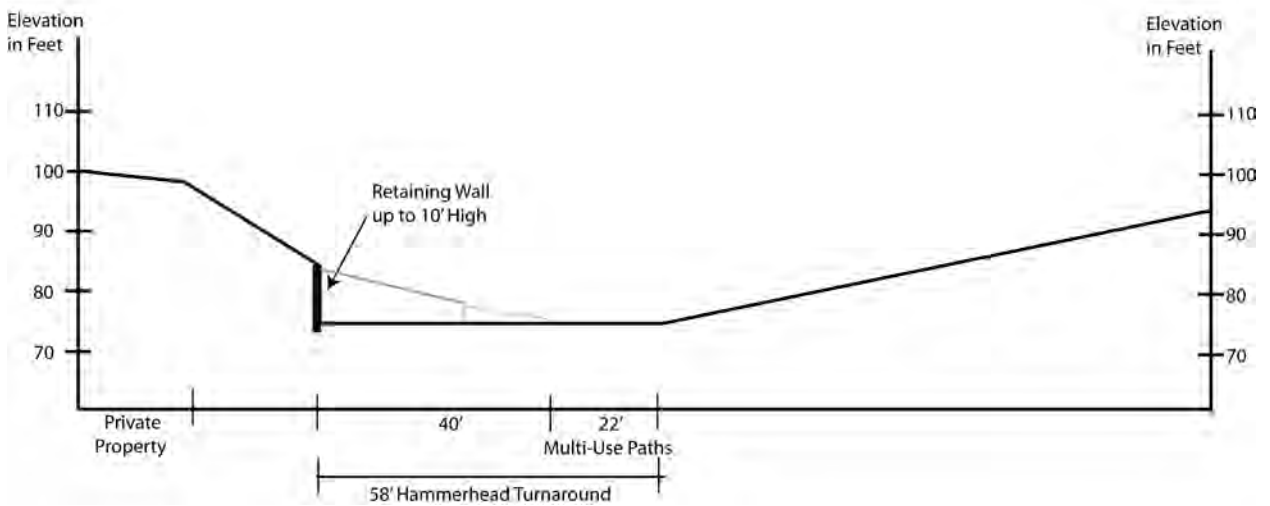


Figure 2-25: South Portal Emergency Vehicle Turnaround Section

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route

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Segment 8 Improvement Concepts:

Alto Tunnel 2,250'/.42 miles; Mill Valley jurisdiction, southern 2/3; Corte Madera jurisdiction, northern 1/3; Marin County ownership except southern portion is N.W. Pacific Railroad – see Appendix G, Right of Way Conditions Study, for ownership details.

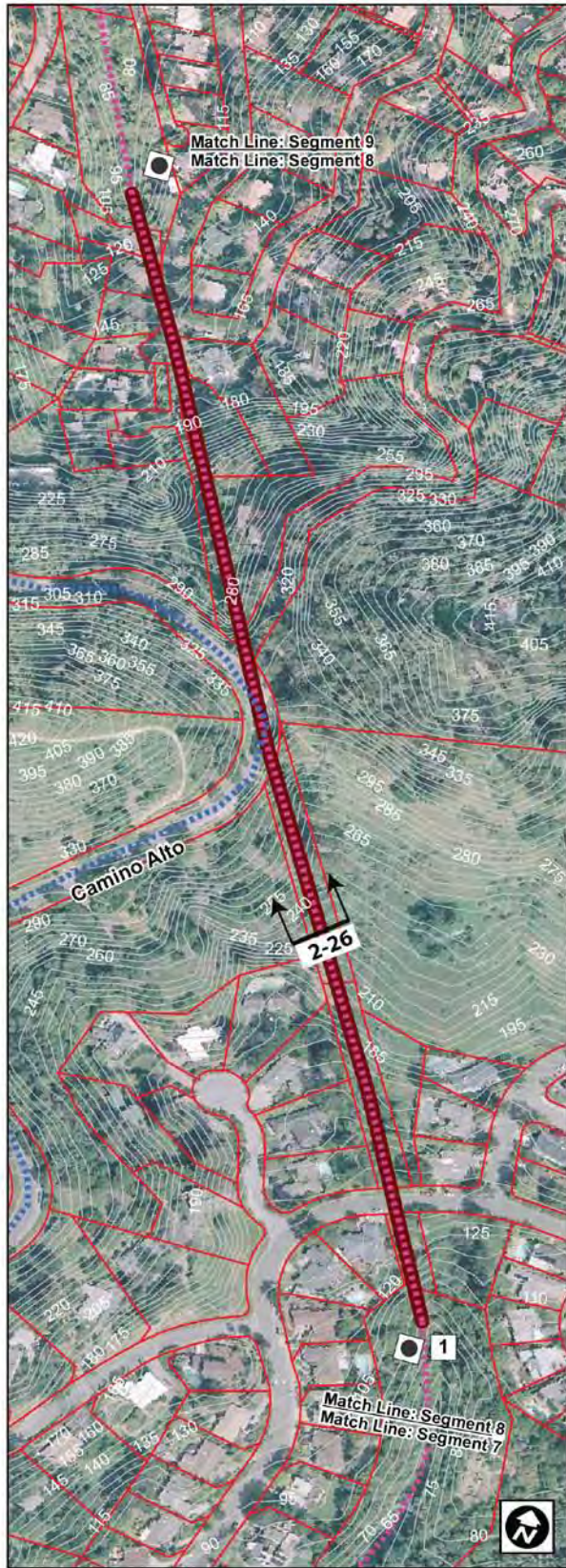
Issues: (discussed in detail in Route overview)

- Emergency and maintenance access. Mill Valley and Corte Madera emergency services staff have reviewed and commented on the improvement concepts for the tunnel.
- Ability to reconstruct the tunnel to provide a safe structure.
- Tunnel rehabilitation impacts.

Tunnel conditions and proposed improvements are detailed in Appendix B, Tunnel Feasibility Analysis, prepared by Jacobs Associates. These are summarized below:

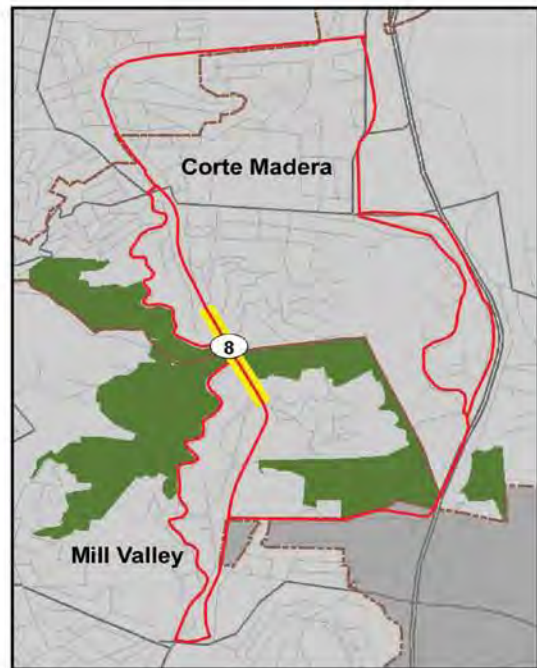
Improvement Concepts:

- Remove fill and debris from the tunnel portals.
- Excavate the concrete plugs, gravel and soil fill in the tunnel using roadheader and traditional earthmoving equipment (no blasting anticipated), and placing steel and shotcrete support to replace the existing timbers as excavation advances.
- Line the tunnel with steel or rock-bolt support and shotcrete (no timber or other combustibles). Backfill any substantial voids in the tunnel. Provide clear interior dimensions of approximately 13 feet wide by 16 feet tall (see Figure 2-25).
- Protect existing structures. Underpinning, retaining structures, or grouting and monitoring.
- Remove rails (and salvage) and ballast, prepare subgrade, place aggregate base for path, and provide wall drains and subsurface path drain.
- Pave the tunnel to provide a minimum 12' wide multi-use shared pathway for bicycles, pedestrians and smaller maintenance and emergency vehicles (standard pickup size, maximum).
- Provide safety and security features. A Memorandum of Understanding (MOU) between agencies could address specific operation and maintenance arrangements. Conceptual improvements and arrangements are modeled on the Cal Park Tunnel MOU. Besides the emergency access corridor, parking/turnaround, bollards and fire hydrants outside the portals, security and safety features and measures at the portals and within the tunnel could include:
 - Lockable gates at each end, with specific hours of operation.
 - Extend electrical service 1300' to tunnel portal.
 - A lighting system with emergency backup.
 - Emergency call and fire alarm stations at regular (approximately 200') intervals including at portals and tunnel midpoint.
 - Video surveillance similar to Cal Park Tunnel.
 - “Leaky wire” system for radio communication, and if possible, cell phone.
 - Fire hose connections every 200'.
 - Sprinkler system throughout.
 - Regulatory signs at portals - traffic control, hours, alternate route(s). System for user notice when maintenance vehicle or other blockage is in tunnel (signboard at each end that can be locked open or closed).
 - Ventilation system.
 - Access control to prevent unauthorized vehicle entry.



Segment 8 Proposed Improvements

Segment Location Map



- Protective graffiti coating on tunnel walls.
- Noise, dust, and traffic control during construction.
- Building protection measures and settlement monitoring of residential structures along the tunnel alignment near portals.

Improvement Cost:

The cost for the tunnel improvements is expressed as a range. Costs are based on extrapolation of actual costs for the nearby Cal Park Tunnel Improvements, as detailed in Appendix B, the Tunnel Feasibility Study, and Section 4 of this Report. They include estimated costs for right-of-way research, negotiation and acquisition discussed and estimated in Appendix G, the Right-of-Way Conditions Analysis.

Low: \$42,900,000 High: \$50,700,000

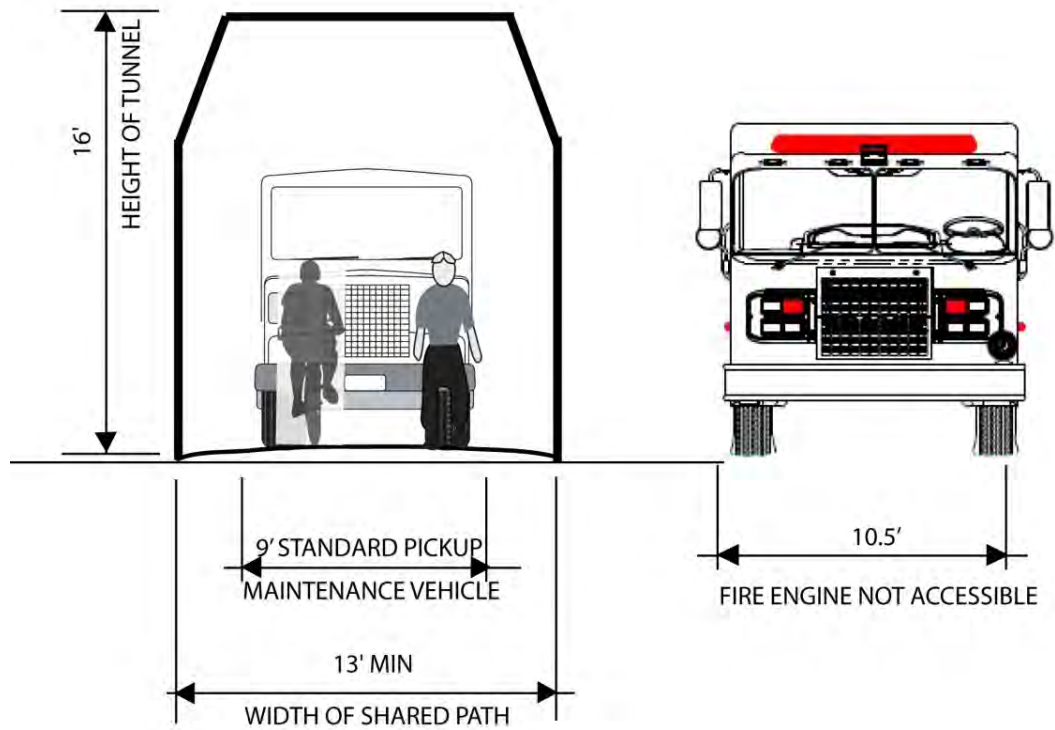


Figure 2-26: Cross-Section through Tunnel



Photo 8-1: Example of similar bike/pedestrian tunnel in Spain

Segment 9A Improvement Concepts:

From northern end of Alto Tunnel to Montecito Avenue and beginning of existing paved path near Tamalpais Drive; 2,310'/.4 miles; Corte Madera jurisdiction; ownership is Marin County and various private parcels. See Appendix G, ROW Conditions Study, for ownership discussion

Issues:

Conditions and issues on the north side of the Alto Tunnel are similar to the south side, except that a larger off-site area drains to the portal area, and it has more riparian vegetation. Issues are detailed in the Segment 7 description.

Improvement Concepts:

Improvement concept details are the same as Segment 7, except for drainage improvements, as noted below:

- Clear and trim existing vegetation. Types and estimated quantities are detailed in the Environmental Considerations Study. A 20' wide clear corridor to the tunnel is included.
- Remove rails and salvage to permit path construction.
- Construct A.C. paved paths – 10' wide for bikes with 2' shoulders, 8' wide for pedestrians (see Figure 2-27).
- Construct emergency vehicle parking and turn-around as illustrated in Figure 2-28, near the tunnel portal. Retaining walls would be required.
- Provide fire hydrants (1,000 GPM) at portal side of emergency access turnarounds.
- Extend water line for fire hydrant at turnaround, and up to tunnel portal for connection to wet-standpipe system in tunnel. A 10" water line was required for the Cal Park Tunnel.
- Install bollards to restrict unauthorized vehicle entry (location TBD between path entry and tunnel portal).
- Construct drainage improvements. Off-site runoff from an approximately 60-acre area discharges to the north portal from above the tunnel portal, a 15-inch pipe from Montecito Avenue, and a 12-inch pipe from Tunnel Lane, as well as other minor off-site flows. Specific drainage improvements include:
 - Install a down drain to convey drainage flow from above the tunnel (approximately 25 acre area).
 - Install a drain system under the path designed to handle to 10 year storm. Larger storm events would potentially inundate the path.
 - Install storm water discharge upstream of the existing 36-inch pipe at Stetson Avenue, which conveys runoff north to Corte Madera Creek.



Photo 9-1 View north along old RR bed

Improvement Cost: \$2,560,000



Segment 9A Improvement Concepts

Segment Location Map



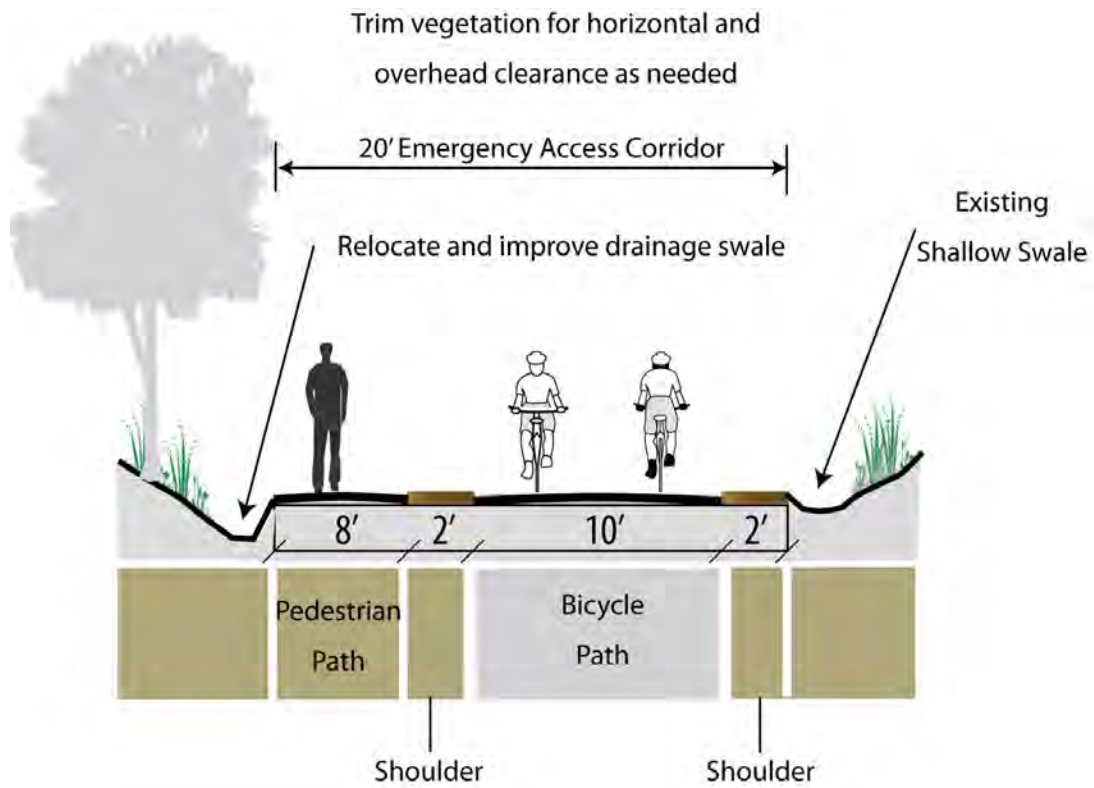


Figure 2-27: Section through Multi-Use Path

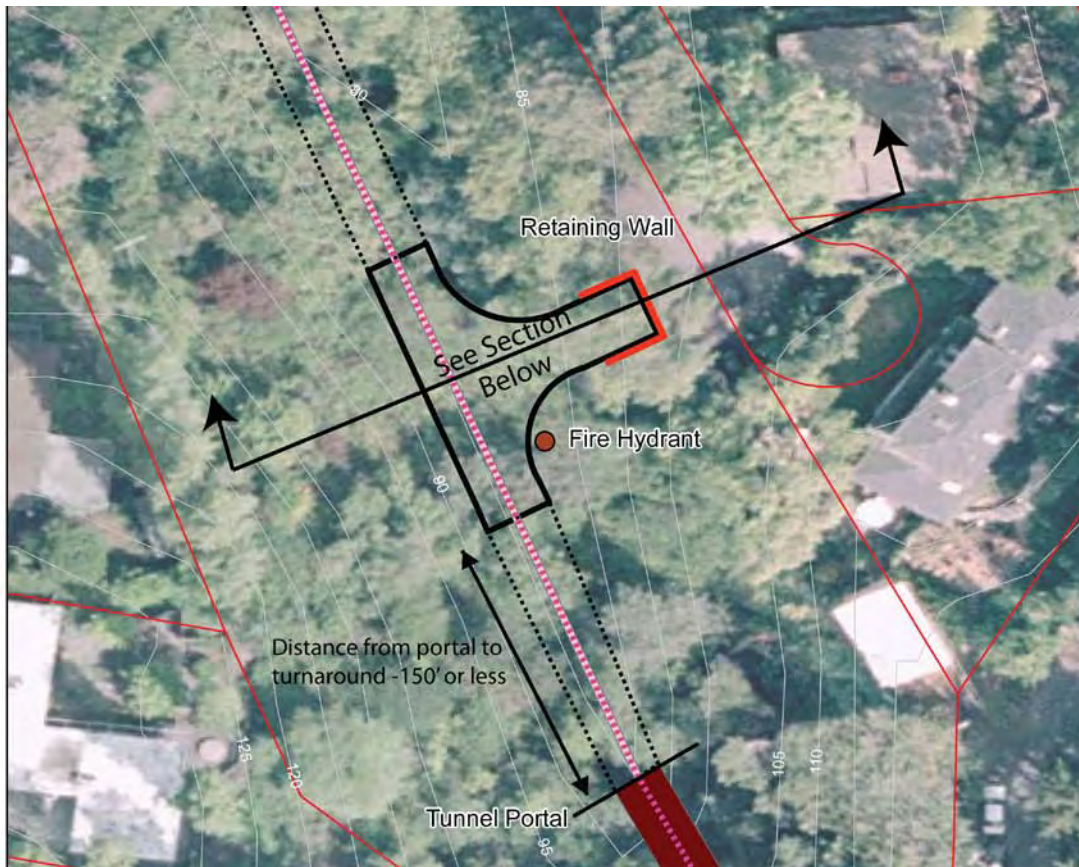


Figure 2-28: North Portal Emergency Vehicle Turnaround Plan

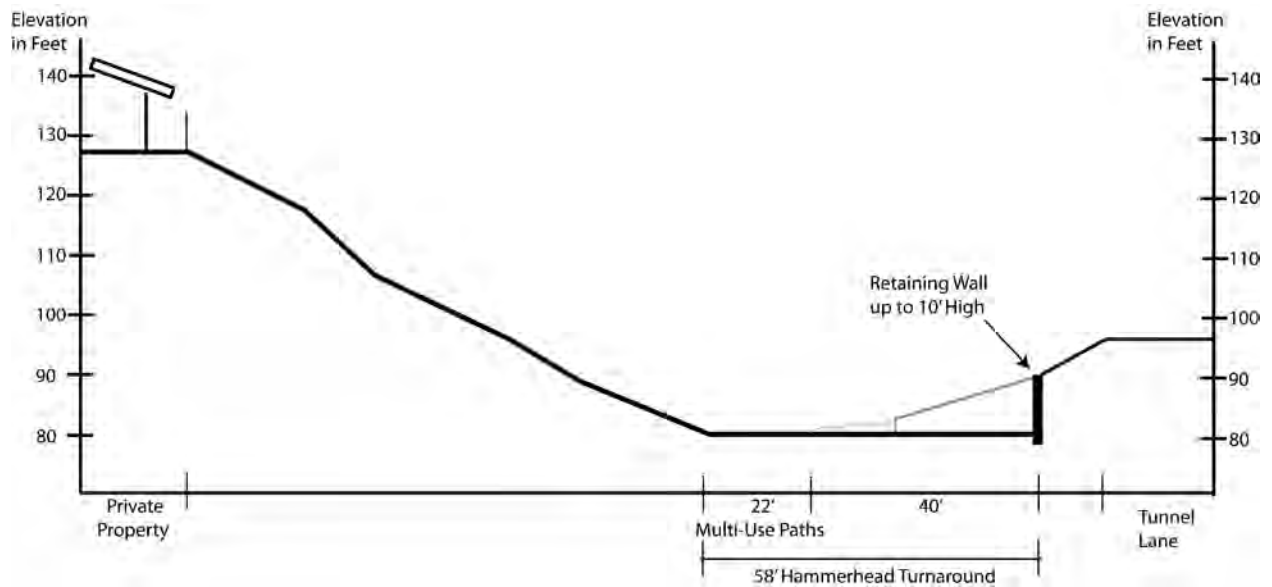


Figure 2-29: North Portal Emergency Vehicle Turnaround Section

Segment 9B Improvement Concepts:

Along Montecito Drive from beginning of existing paved path near Tamalpais Drive to Redwood Avenue; 352'/.06 miles; Corte Madera jurisdiction; Corte Madera road right-of-ways; rail right-of-way is Marin County and various private parcels. See Appendix G, ROW Conditions Study, for ownership discussion.

Issues:

- Bicycle access – Redwood Avenue is a very busy street and challenging to cross or follow. Bicyclists are connecting to or from the route in all directions. There are separate routes for pedestrians and bicyclists. The current bicycle access follows Montecito Drive, which functions as a residential street connector, as well as a downtown parking area, with perpendicular parking on the east side.
- Traffic flow –The Town of Corte Madera recently reconstructed this portion of Redwood Avenue and adjacent roads. Generally the roads, intersections, parking and paths are working well. However, if the Alto Tunnel route is opened, improvements for north-south bicycle and pedestrian connections to this segment to accommodate up to 2,740 average daily users will be important to consider.
- Adjacent land uses/improvements – From the informal unpaved path on the railroad right-of-way, north of this segment, there is an existing approximate 8' wide concrete path paralleling Tamalpais Drive. It passes through a decorative bus stop shelter just south of Tamalpais. There is a matching shelter north of Redwood Avenue. The shelters are part of the overall park, streetscape and landscape improvements that enhance downtown Corte Madera.



Photo 9-2 View north across Redwood Avenue.

Improvement Concepts:

- Construct a 12 foot wide Class I multi-use pathway from Segment 9A to Redwood Avenue by widening or replacing the existing 8 foot path south of Redwood Avenue (requires transitioning from the separate 6 foot wide pedestrian path and 10 foot wide bike path proposed to the south). Either construct a segment bypassing the existing bus shelter to the west, requiring the removal of a few parking spaces, or relocate the bus shelter to the landscape area to the east.
- Construct a path connecting to First Street to accommodate travel to the west and northwest.
- Montecito Bike Route Alternative. An on-street alternative to the above multi-use path would be to route bicycles north on Montecito, through the perpendicular parking area south of Redwood Avenue. Conflicts between bicyclists and vehicles would need to be carefully considered in final design.
 - If this alternative is implemented, consider reconfiguring the head-in 90-degree parking on Montecito Drive to back-in angled parking to enable improved sight lines between parking motorists and bicyclists. Back-in angled parking has been utilized in a number of downtown settings to improve visibility and reduce crashes from cars backing out into traffic.

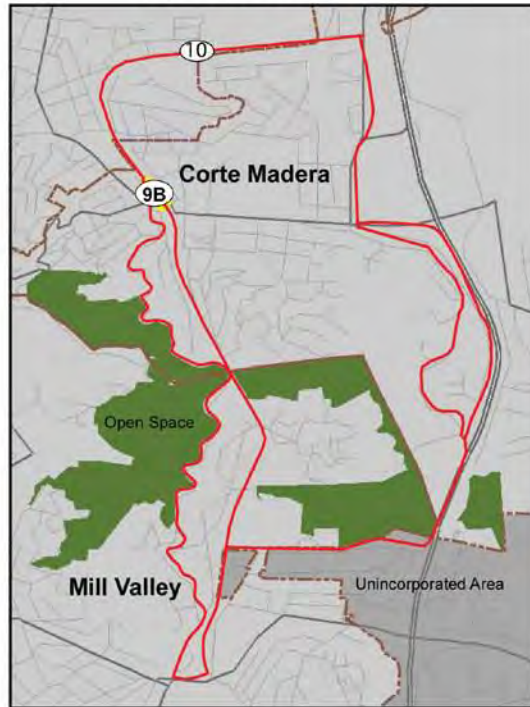


Segment 9B and 10 Improvement Concepts

(see page 2-1 for Master Map Legend)

- Existing Sandra Marker Trail
- High vis. crosswalk
- Reconstruct planter, re-stripe parking to provide space for 12' multi-use path - see figure 2-30
- Figure 2-31
- High vis. crosswalk
- Existing bus shelter structures
- Bike path to bypass bus shelter (eliminates a few parking spaces)
- On street bike route alternative
- Widen existing 8' pathway to 12' multi-use path

Segment Location Map



- Improve Redwood Avenue Crossing. Replace the standard crosswalk across Redwood Avenue at Montecito Drive with a high-visibility crosswalk to increase awareness of the crosswalk. Add high-visibility advance crosswalk and crosswalk signing. Other improvements that could be considered to facilitate bike and pedestrian movements (not included in the cost estimates) include:

- Consider extending the curb on the north side of Redwood Avenue at Montecito Drive to reduce the crosswalk's length and improve visibility between approaching motorists and pedestrians and bicyclists using the crosswalk. The curbs could be extended



Photo 9-3: View south along path from Redwood Avenue.

- across the bus lane to create an enlarged bus stop. The curb could have a rolled edge so the bus and large trucks could drive across it if necessary.
 - Consider raising Redwood Avenue's intersection with Montecito Drive to create a "speed table" to encourage slower vehicle travel speeds through the intersection.
 - Consider removing the westbound-to-southbound left-turn lane from Redwood Avenue into Montecito Avenue to create a center refuge island for crossing pedestrians and bicyclists. Designate the southern leg of Montecito Drive intersection with Redwood Avenue as an exit only. Entrance and exit would remain available at First Street.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: **\$216,000**

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Segment 10 Improvement Concepts:

Connection along Montecito Drive north of Redwood Avenue to the existing Sandra Marker Trail, and along the Sandra Marker Trail north and east to Tamal Vista Boulevard at Wornum Way; 6,638'/1.4 miles; County bike route # 15 and 16; Corte Madera jurisdiction and road right-of-ways; Sandra Marker Trail is owned by Marin County and maintained by Marin County Parks.

Issues:

- Access for bicyclists, pedestrian and persons with disabilities – along Montecito Drive north of Redwood Avenue there is no path, and pedestrians as well as bicyclists mix with cars on the residential street/downtown parking lot to reach the Sandra Marker Trail.
- Pathway capacity to carry additional traffic; potential conflicts between bicyclists and pedestrians.

Improvement Concepts:

- Construct a Class I pathway connection north of Redwood Avenue by re-stripping the adjacent parking areas on either side of the existing 12' wide planting strip a few feet away. Use the resulting 16' wide space for a 4' planter and a 12' multi-use path (see Figure 2-30), to extend north to connect to the existing Sandra Marker Trail. Requires two high-visibility crosswalks where the path crosses the parking access road. Montecito Bike Route Alternative.
- An on-street alternative to the above multi-use path would be to route bicycles north on Montecito Drive, through the perpendicular parking area north of Redwood Avenue. Conflicts between bicyclists and vehicles would need to be carefully considered in final design.

If this alternative is implemented, consider reconfiguring the head-in 90-degree parking on Montecito Drive to back-in angled parking to enable improved sight lines between parking motorists and bicyclists. Back-in angled parking has been utilized in a number of downtown settings to improve visibility and reduce crashes from cars backing out into traffic.

- As increased use warrants, add a separate 8 foot wide pedestrian path parallel to the existing eight-foot paved path and widen existing 8 foot path to 10 feet, and designate for bikes (see Figure 2-31).
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

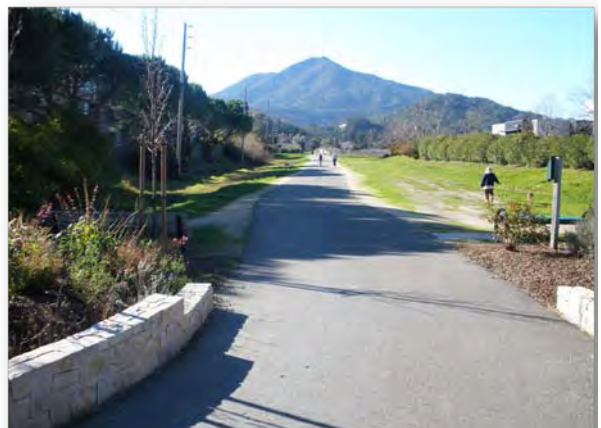
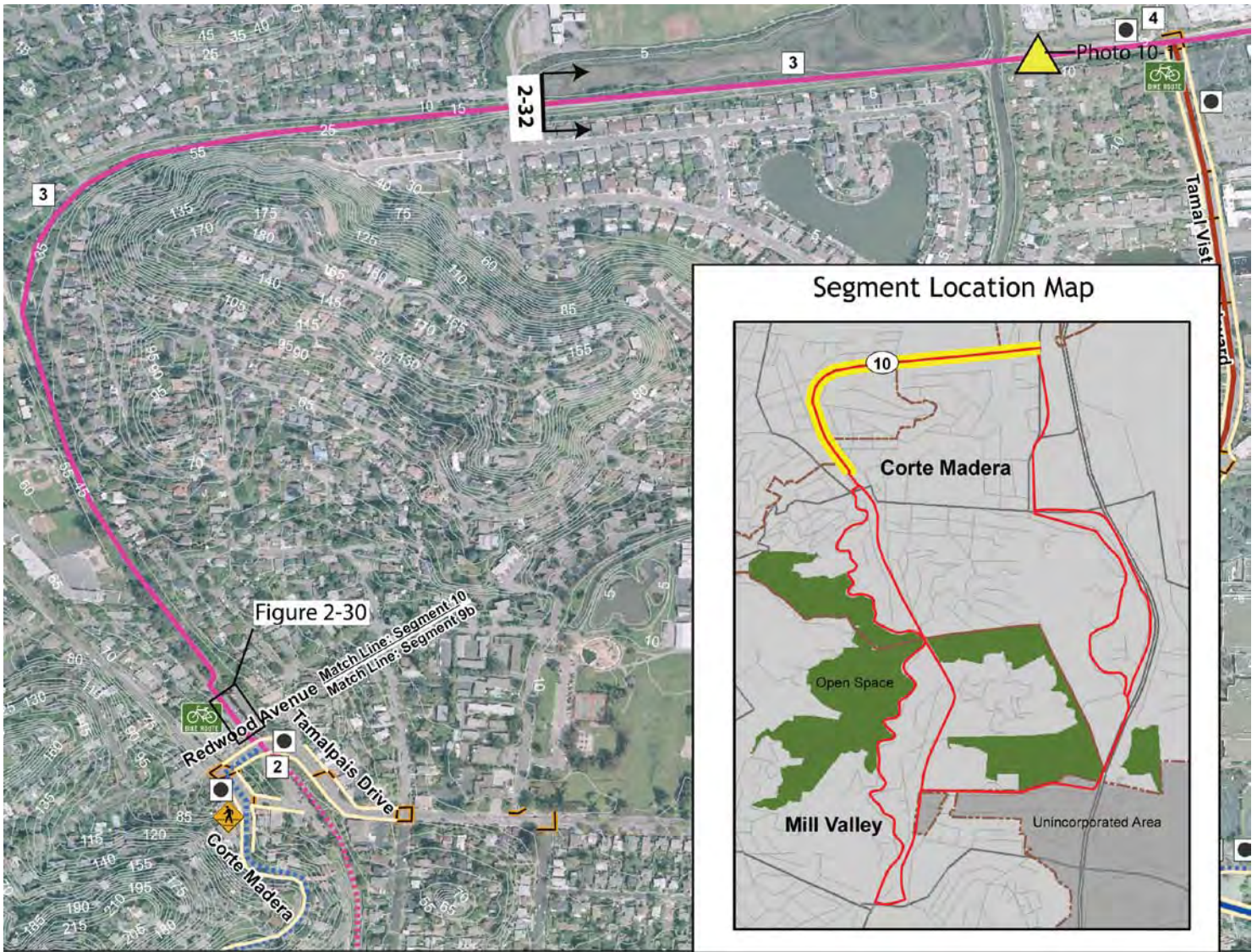
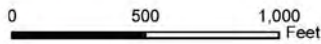


Photo 10-1: View west from intersection of Sandra Marker Trail and Tamalpais Drive

Improvement Cost: \$164,000



Segment 10 Improvement Concepts



(see page 2-1 for Master Map Legend)

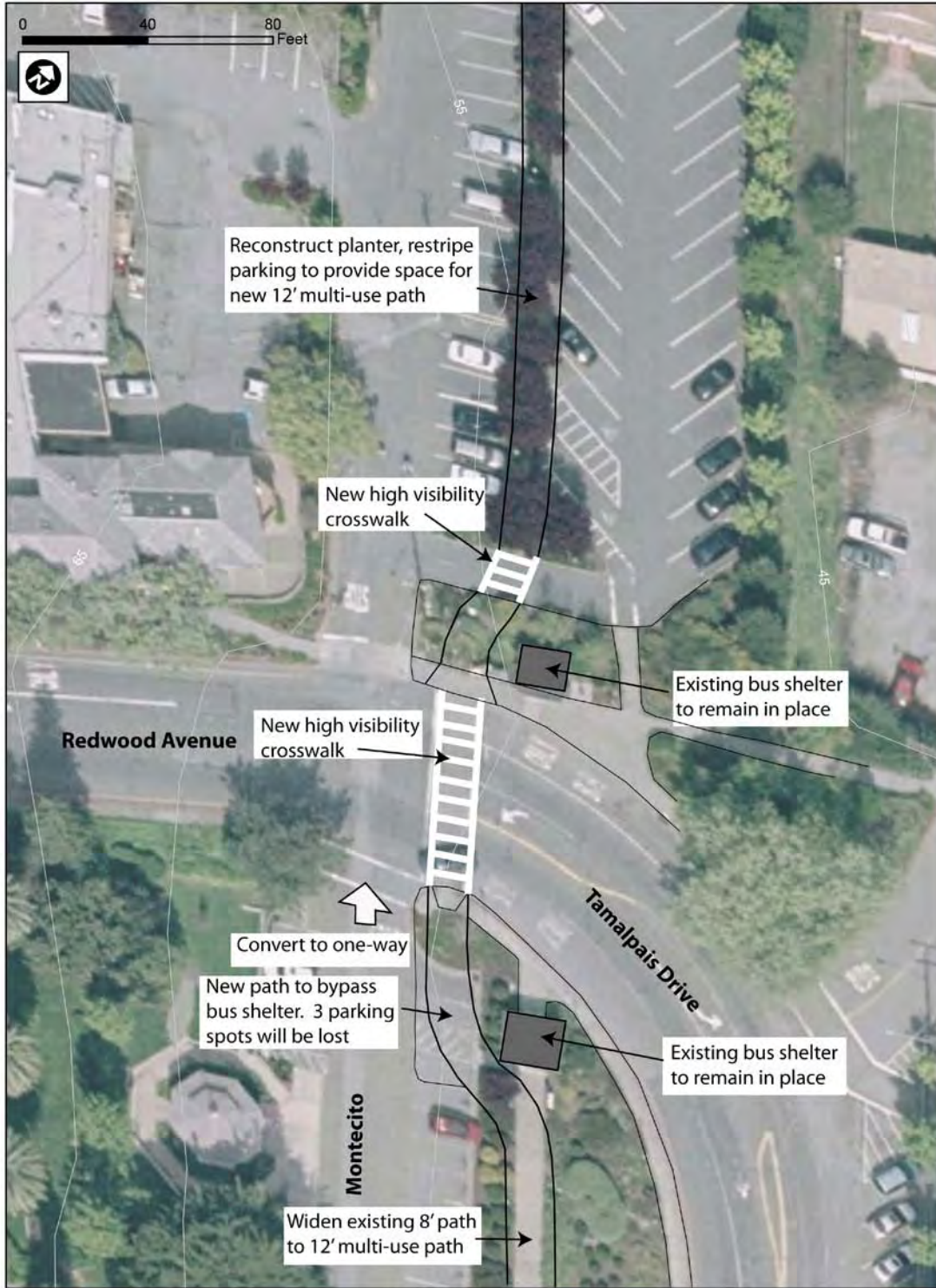


Figure 2-30: Plan View of Improvements near Redwood/Montecito Intersection

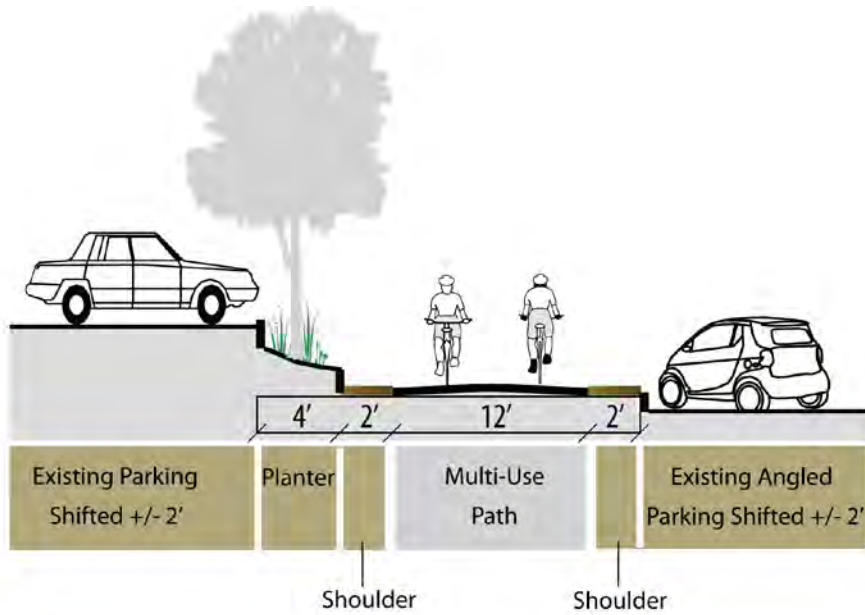


Figure 2-31: Section through Re-Constructed Planter and New Path

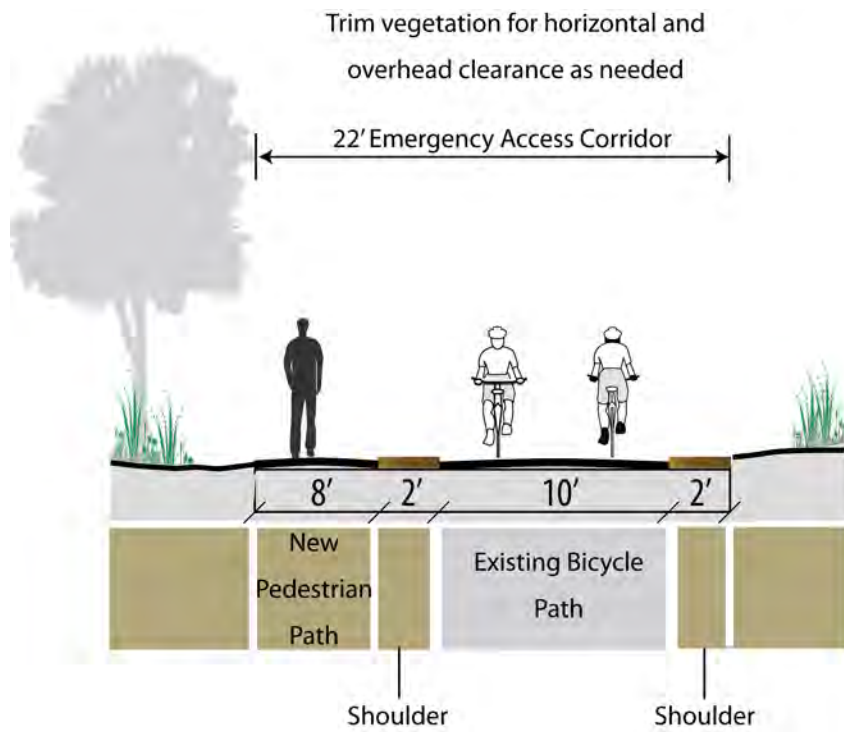
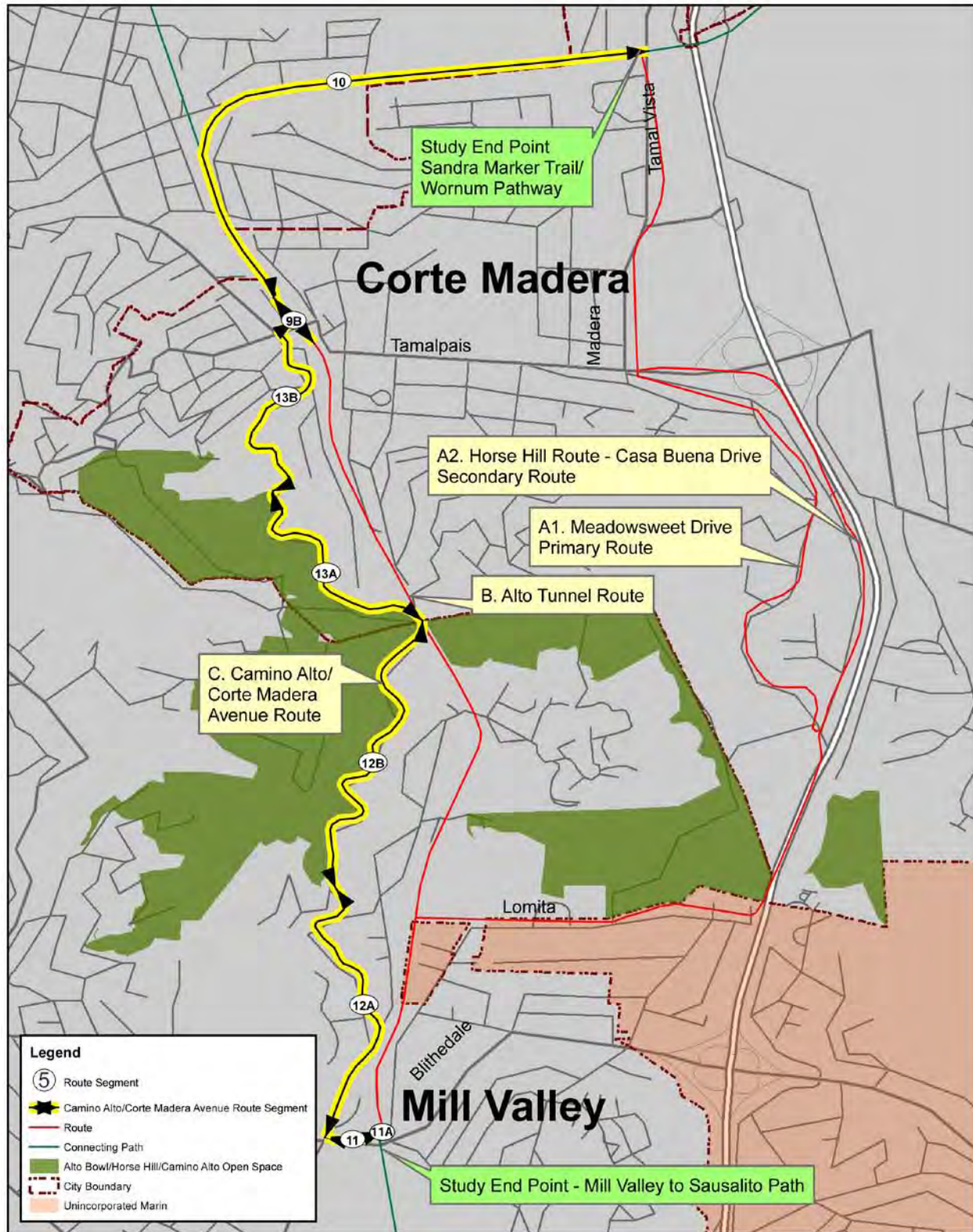


Figure 2-32: Section Through Existing Sandra Marker Path with New Pedestrian Path

Figure 2-33: Camino Alto/Corte Madera Avenue Route Overview



Route Alternative C - Camino Alto/Corte Madera Avenue Route

Overview:

This winding route passes through hilly terrain, following Camino Alto north through the city of Mill Valley, and transitioning to Corte Madera Avenue in the Town of Corte Madera at the city limit line. The southern portion of Camino Alto is mainly suburban in character, with adjacent commercial and residential uses. As the route continues north the terrain becomes steeper and more wooded, with low density residential properties backing up to the road on the east, and Marin County's Camino Alto Open Space Preserve on the west. Beyond the open space preserve, the northern portion of Corte Madera Avenue is an older residential neighborhood, with many residences with driveways, fences, parking walls, and other improvements adjacent to the roadway. The north end of the route continues along Corte Madera Avenue, east on Redwood Road through adjacent commercial uses in the older downtown area, then along Montecito Drive, to its connection at the existing Sandra Marker Trail. Many bicyclists continue north on Corte Madera Avenue to Magnolia Avenue, College Avenue and Kent Avenue to access the Upper Ross Valley, which in turn leads to destinations and routes in rural areas of West Marin.

This route consists of four major segments:

Segment 11/11A: Short connection along E. Blithedale Avenue from northern end of Mill Valley-Sausalito Path to Camino Alto, including improvements to the E. Blithedale crossing.

Segment 12: Along Camino Alto from the intersection of E. Blithedale Avenue to Mill Valley/Corte Madera city limit (has North and South sub-segments – 12A and 12B).

Segment 13: From Mill Valley/Corte Madera city limit along Corte Madera Avenue to Redwood Avenue in Corte Madera, and along Redwood Avenue east to Montecito Drive (has North and South sub-segments – 13A and 13B).

Segment 10: Connection along Montecito Drive north of Redwood Avenue to the existing Sandra Marker Trail, and along the Sandra Marker Trail north and east to Wornum Way at Tamal Vista Ave.

Total length is 19,430 feet/3.7 miles

Issues:

Bicycle conflict with vehicles. This route is heavily used by bicyclists, and many have stated that they would use the route even if the Alto Tunnel was opened because they enjoy its scenic and challenging qualities. Bicycles traveling slowly uphill frequently impede vehicle traffic on this busy road.

Bicycle access. This route exposes bicyclists to traffic on steep hills and sharp curves, often with little or no shoulder. There are two improvement concepts to better accommodate bicycles on this route:

- 1) Bicycle climbing lane. Ideally, a 5'-7' wide bicycle climbing lane would be constructed adjacent to the travel lane, on the uphill side of the route (east side on Camino Alto, where some shoulder already exists most of the way, and west side on Corte Madera Avenue, where there is currently little or no shoulder). Bicycles could continue to share the traffic

lane on the downhill side (west side on Camino Alto and east side on Corte Madera Avenue), where they generally are able to travel at the same speed as traffic. This arrangement has proved successful in similar settings in other communities, especially when right-of-way width is limited.

2) **Bike lanes.** Bike lanes are an alternative to climbing lanes because they provide a space on the downhill side for bicyclists, including children and parents with children, who are not comfortable sharing lanes with traffic on such a busy road. On Camino Alto there is sufficient space that bike lanes are generally an interchangeable option to the climbing lane, due to the available width of the right-of-way. Corte Madera Avenue generally has minimal shoulders, steeper side slopes, more trees, and, on the northern portion, several residences with driveways, fences, parking walls, and other improvements adjacent to the roadway. It would be far more feasible to create one climbing lane than bike lanes on both side on this highly constrained road.

Pedestrian access. Pedestrian facilities on this route are discontinuous and have minimal current use. Providing a continuous pedestrian path or sidewalk along this route would be challenging due to right-of-way constraints, topography, native trees and vegetation, and existing improvements, such as drainage and privately-constructed improvements, within the right-of-way. Continuing sidewalks on the southern portion of Camino Alto would not involve major expense or impact due to the gentler terrain and more suburban setting, but the northern portion of Camino Alto and southern portion of Corte Madera Avenue are very steep, rugged, and wooded. Adding a sidewalk or path would be challenging. The study investigates options for where and how a sidewalk or path could be added. It also acknowledges the desire, expressed in public comments, for a crossing of the route near the city limit line to connect open space trails on either side.

Drainage. A number of significant natural drainages, as well as some man-made drainage systems, cross the route in culverts under the roadway. The drainages are likely to require extension in conjunction with widening. Public comments noted that the roadway is sometimes flooded when culverts overflow during storms. Study of the drainage area, capacity, or condition of the culverts is beyond the scope of this study, and the minor widening proposed will add negligible increased runoff.

Native trees and vegetation within the right-of-way. Widening of the roadway to provide bike lanes or a climbing lane, and to provide sidewalks or a pedestrian pathway would require the removal of some native trees and vegetation, and some ornamental trees and shrubs. In addition, there would be visual changes to the rural and wooded character of the route. These changes can be minimized and addressed through careful design.

Cultural resources. This alignment is sensitive for both archaeological and historic resources. Archaeological and historic resources have been mapped in the project area.

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Segment 11/11A Improvement Concepts:

Short connection along E. Blithedale Avenue from northern end of Mill Valley Sausalito Path to Camino Alto, 570'/.11 miles, County bike route #5. Includes improvements to E. Blithdale that could serve all three study routes.

See improvements description under Horse Hill Route.

Segment 12A Improvement Concepts: Along Camino Alto from E. Blithedale Avenue to Overhill Road; 3,430', .65 miles; Mill Valley jurisdiction and road right-of-way.

Issues: (discussed in detail in Route overview)

- Bicycle conflict with traffic.
- Bicycle access – climbing lane or bike lanes. Either option (two bike lanes 4-5 feet wide or a climbing lane 8' wide with a 2' shoulder on the opposite side) could be accommodated with a pavement section approximately 34 feet wide, as shown in Figure 2-34. By policy, the City of Mill Valley prefers bike lanes so that there is space for bikes outside the motor vehicle lanes in both directions. The determination of the preferred option could be made later without significantly changing the improvement concepts and costs outlined below for widening the road.
- Pedestrian access – Widening for bike lanes would improve access for pedestrians to some extent. An option would be to construct a sidewalk on the west side of the road to connect to the existing west side pathway on Corte Madera Avenue, as shown in Figure 2-35.
- Drainage improvement requirements.
- Impact on native trees and vegetation within the right-of-way.

Improvement Concepts:

The first 400 lineal feet (l.f.) of the segment has an existing 55'-wide paved section, including right turn and merge lanes. There is room to re-stripe for bike lanes or a climbing lane. There are sidewalks on both sides for the first 315'.

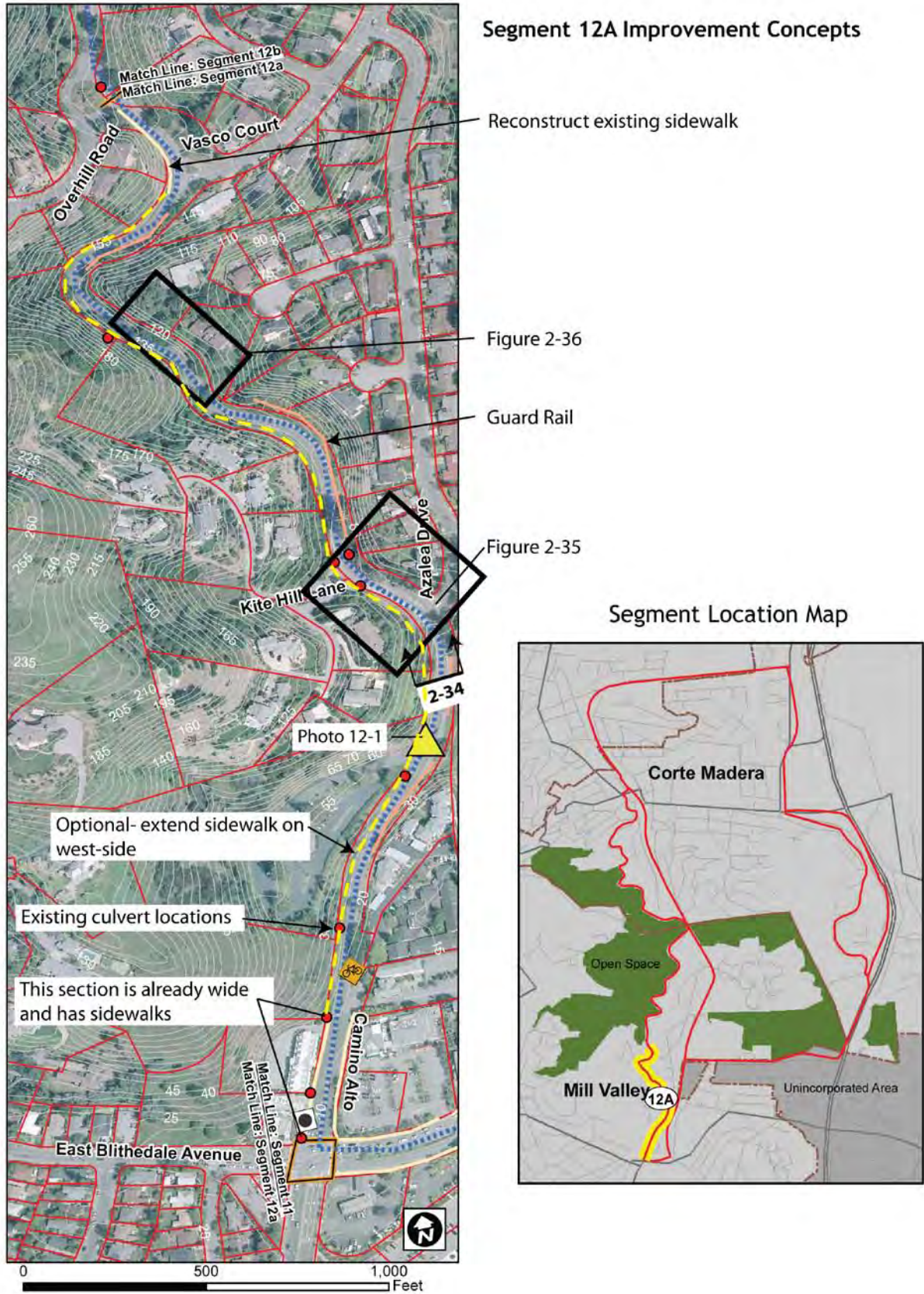
- Re-stripe centerline and shoulders for bike lane or climbing lane.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

A new bike detector loop is to be installed in the left turn lane of the East Blithedale/Camino Alto intersection as part of and NTPP capital project.

The next 1100 l.f., up to Azalea Drive typically has an approximate 28' paved section – two 11' lanes and typically an approximately 6' wide paved shoulder on the east side, except from Azalea Drive to just north of Kite Hill Lane, where there is very little shoulder on the east, adjacent to a steep slope with groves of eucalyptus trees. Typically there is a curb on the west side. An additional 4 - 6' of pavement width would be required to construct the uphill climbing lane or the bike lanes for this 1100' segment. Generally, widening could occur on the west side of the road.



Photo 12-1 View north along segment 12a with shoulder on right side



There is existing sidewalk on the west from Azalea Drive to Kite Hill Lane. This would have to be rebuilt in conjunction with widening.

Specific improvement elements for this 1100 foot segment include:

- Trimming and clearing of vegetation (mostly ornamental shrubs; potentially several eucalyptus trees on east side north of Kite Hill Lane need to be removed to accommodate widening).
- Grading for widening, primarily on the west side. Extend 4 existing culverts and provide new inlet on uphill side, or new discharge structure on downhill side.
- Relocate two utility poles and one fire hydrant.
- Construct retaining walls, average 3' high, primarily on the west side.
- A.C. paving, approximately 6 feet additional width.
- Re-stripe centerline and shoulders for bike lane or climbing lane.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- An option is to construct 5' sidewalk, curb and gutter on west side from 400' north of East Blithedale to connect to the reconstructed existing sidewalk opposite Vasco Court (1,100 l.f. in this portion). Retaining wall height would need to be constructed or increase an average of about 2' along this portion.

From Azalea Drive to Overhill Road (approximately 2,000 lineal feet) the lane widths remain 11' but the shoulder is narrower – typically from 3' to 6' wide on the east, but in some locations virtually zero. The side slopes are steeper than the section to the south, requiring higher retaining walls, and the adjacent vegetation is mixed grassland and oak bay woodland. Typically the road would need to be widened by 4' to 10' to provide room for bike lanes or a climbing lane. About ½ of this portion, or 1,000 l.f., could be constructed with minor grading and vegetation removal. Approximately 1/3 of the remainder, or 333 l.f. would require major grading and vegetation removal, including some small oaks and bays. Approximately 2/3, or 666 l.f. will require construction of a 4' to 6' high retaining wall, primarily on the west/uphill side of the road to provide space for widening. The retaining wall construction may require removal of a few trees, but could generally avoid trees.

It would generally not be feasible to widen this portion to provide a sidewalk without significant additional expense in height of walls as well as impact on vegetation. Construction of a sidewalk in this segment is not proposed due to relatively low existing and projected pedestrian use relative to the potential impact and expense of construction. Providing the climbing lane or bike lane improvements will provide some informal improvement for pedestrian access.

Specific improvement elements include:

- Trimming and clearing of vegetation.
- Grading, cut and fill for widening and retaining walls.
- Reconstruct approximately 340' of existing 5' sidewalk, curb and gutter on west side from Overhill Road to Vasco Court. Retaining wall height would need to increase an average of about 2' along this portion.
- Retaining walls – approximately 4' to 6' high, average of 5'.
- A.C. paving, approximately 6 feet additional width.
- Extend 4 existing culverts and provide new inlet on uphill side, or discharge structure on downhill side.
- Re-stripe centerline and shoulders for bike lane or climbing lane.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

DRAFT - Mill Valley to Corte Madera Bicycle and Pedestrian Corridor Study

- An option is to construct 5' sidewalk, curb and gutter on west side from 400' north of E. Blithedale to connect to the reconstructed existing sidewalk opposite Vasco Court (1,660 l.f. in this portion). Retaining wall height would need to be constructed or increase an average of about 2' along this portion.

Improvement Cost: **\$1,390,000**

Optional sidewalk extension to Overhill Road, add: **\$821,000**

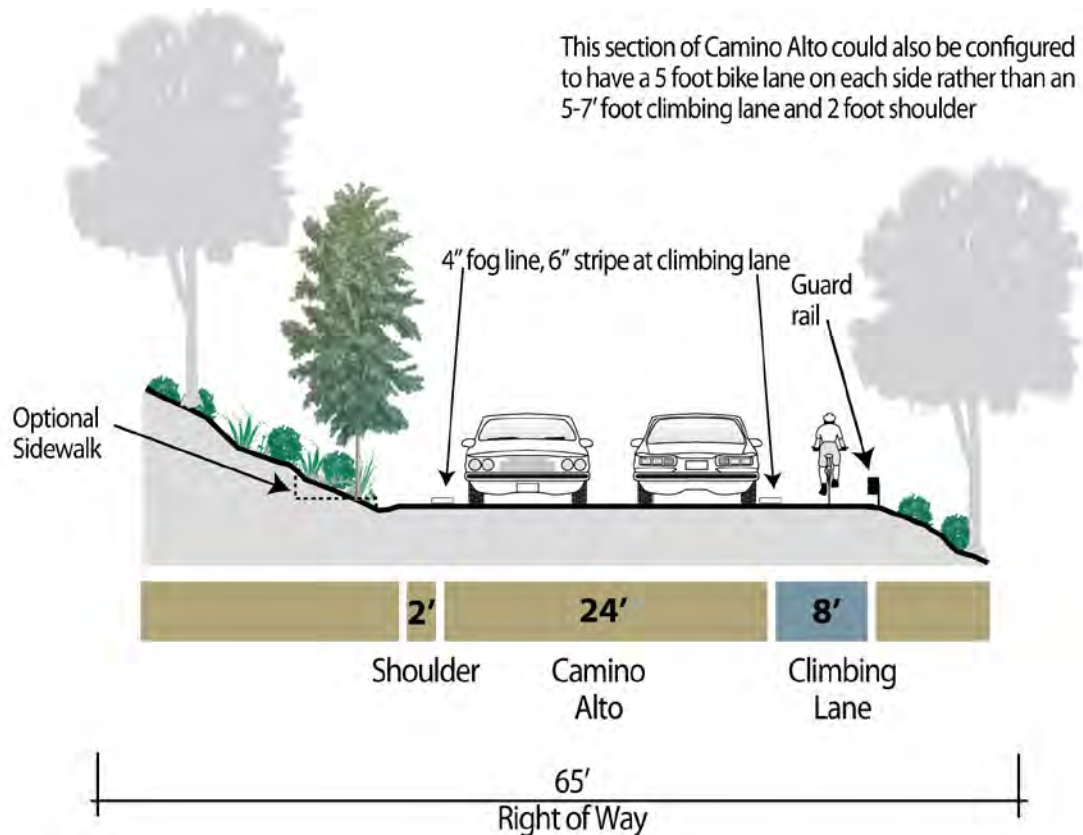


Figure 2-34: Section at Southern Portion Camino Alto

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route

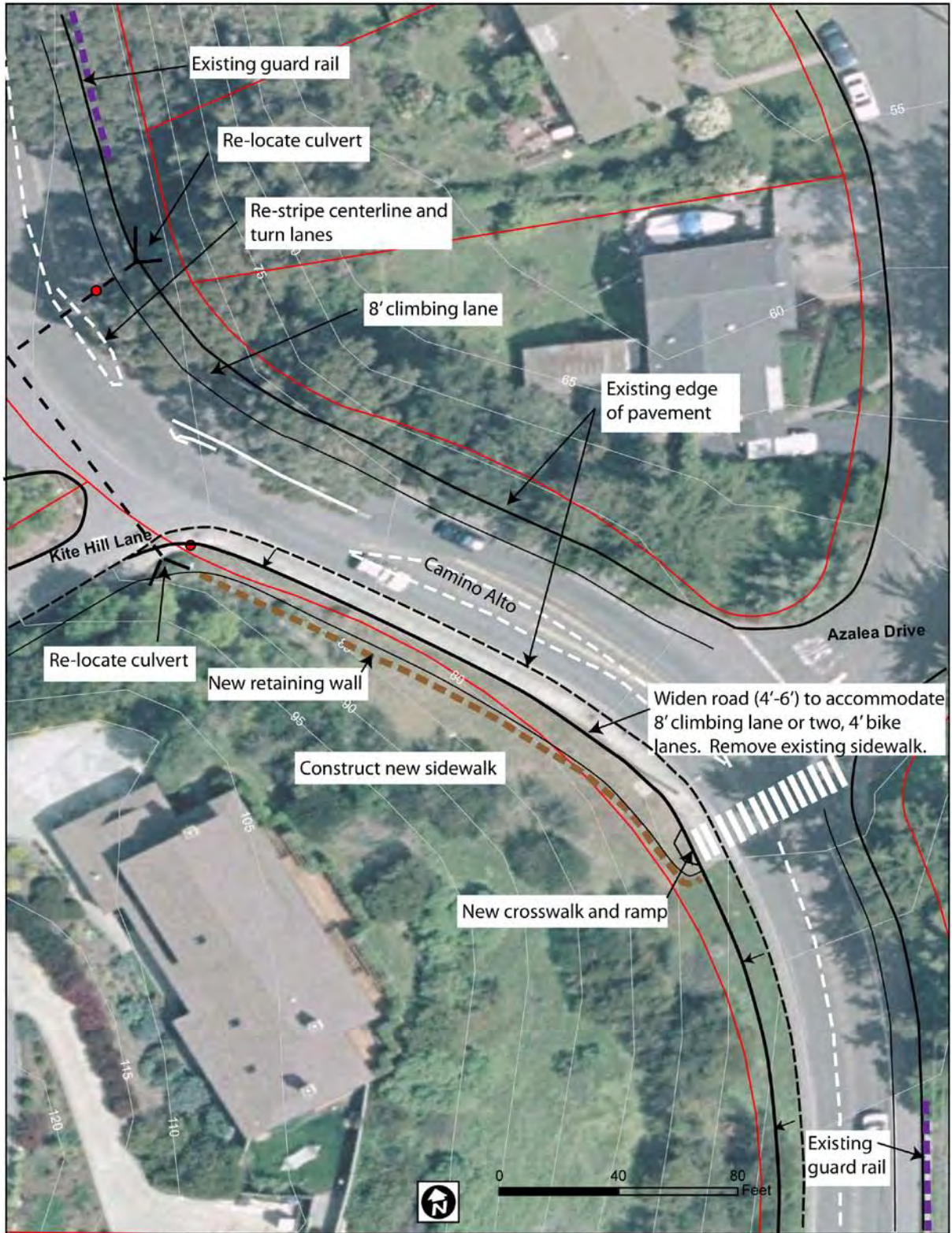


Figure 2-35: Camino Alto Improvements Between Azalea Drive and Kite Hill Lane

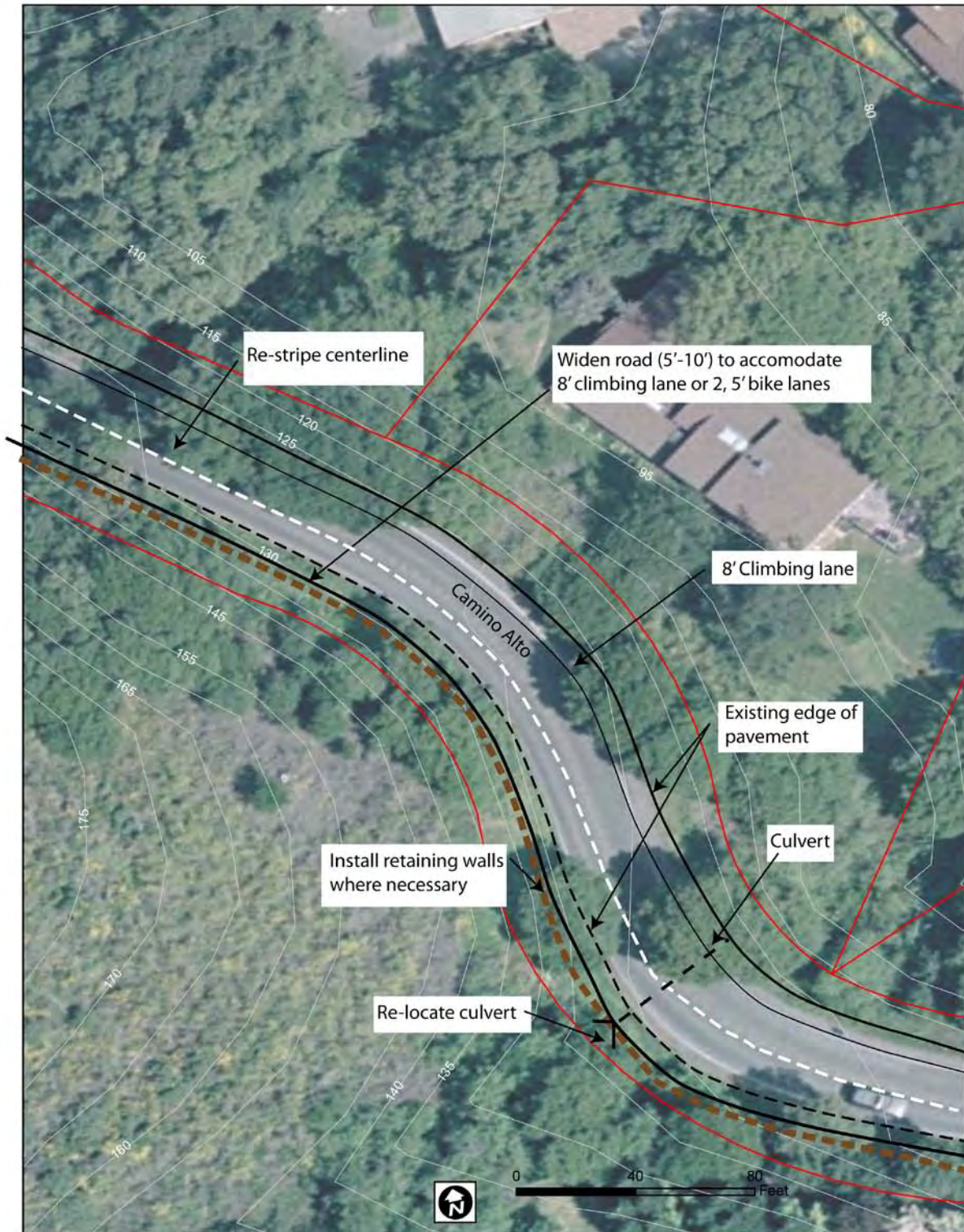


Figure 2-36: Camino Alto Improvements between Kite Hill Lane and Overhill Road

Segment 12B Improvement Concepts:

Along Camino Alto from Overhill Road to Mill Valley/Corte Madera city limit; 3850', .7 miles; Mill Valley jurisdiction and road right-of-way.

Issues: (discussed in detail in Route overview and Segment 12A)

- Bicycle conflict with traffic.
- Bicycle access – climbing lane or bike lanes. By policy, the City of Mill Valley prefers bike lanes so that there is space for bikes outside the motor vehicle lanes in both directions.
- Pedestrian access – As with the northern portion of Segment 12A, it is assumed that the relatively low existing and projected pedestrian use does not justify the cost and impact of a separate sidewalk or path. The climbing lane or bike lane improvements will provide some informal improvement for pedestrian access.
- Drainage improvement requirements.
- Impact on native trees and vegetation within the right-of-way.
- Open Space Trail Crossing and Connection - just south of the city limit line, trails from the adjacent open space preserves intersect Camino Alto. Public comments indicated that it is desirable to establish a safer crossing for trail users, including equestrians. The Bob Middagh Trail intersects from the east, and the Camino Alto Fire Road intersects from the west.

This intersection occurs on a relatively long straight portion of Camino Alto, approximately 550 l.f. Heading north there is approximately 180 l.f. of sight distance to the trailhead on the east side, 145 feet from that trail to the trail on the west side, and 225 feet of sight distance heading south to the west side trail. The stopping sight distance standard for a 30 m.p.h. road is 200 l.f., while the posted speed limit on this road is 25 m.p.h. Addressing this issue is outside the scope of the current study. The conceptual climbing lane or bike lane improvements would provide some level of benefit to pedestrians traveling between the two trailheads, but the bike lane(s) will also need to be defended by signing and enforcement to prevent unauthorized trail user parking from blocking them.

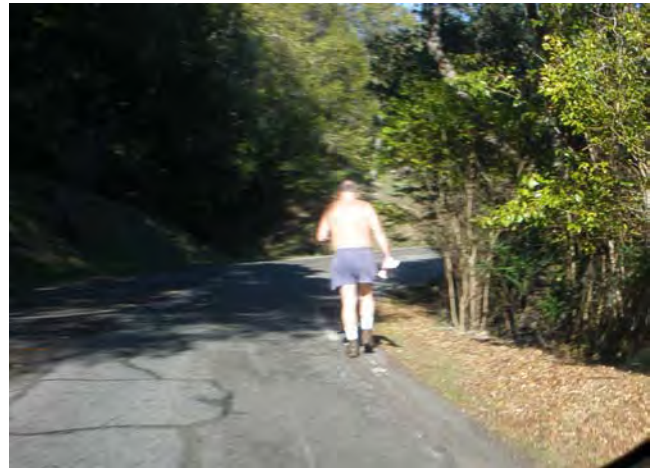
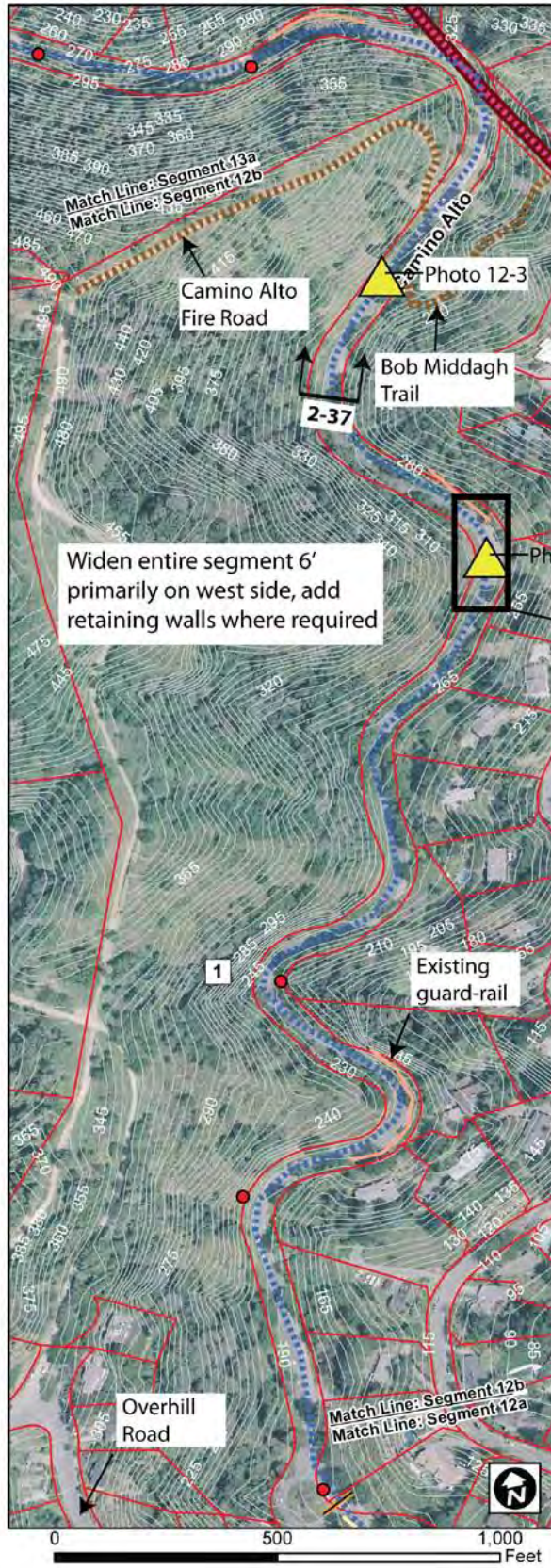


Photo 12-2 View north along segment 12b; little or no shoulder.



Photo 12-3 View north along Camino Alto from Bob Middagh Trail on right, to Camino Alto Fire Road on left.



Segment 12B Improvement Concepts
(see page 2-1 for Master Map Legend)

Photo 12-3

Photo 12-2

Figure 2-38

Segment Location Map



Improvement Concepts:

From Overhill Road to the city limits (approximately 3,850 lineal feet), the road shoulder would need to be widened the entire length to provide width for bicyclists. Approximately 1,925 l.f. has sufficient, relatively level space to widen with minor grading. Approximately 1,925 l.f. would require a retaining wall, primarily on the west/uphill side of the road. Specific improvement elements include:

- Trimming and clearing of vegetation.
- Grading, cut and fill for widening and retaining walls.
- Retaining walls – approximately 2' to 6' high, average of 4'.
- A.C. paving, approximately 6 feet additional width.
- Extend 2 existing culverts and provide new inlet on uphill side, or discharge structure on downhill side.
- Re-stripe centerline and shoulders for bike lanes or uphill climbing lane. Due to topographic constraints and adjacent native trees, either two 4' bike lanes or one 5' to 7' climbing lane plus a 1' to 2' shoulder widening are envisioned, transitioning from the wider facilities to the south.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: \$1,3600,000

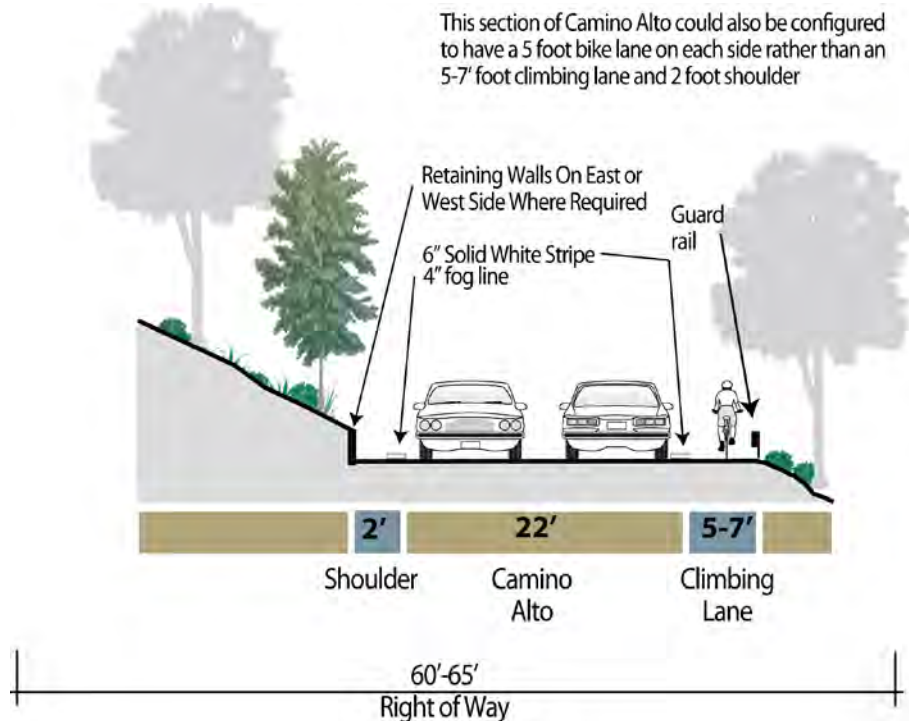


Figure 2-37: Section near Top of Camino Alto

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route

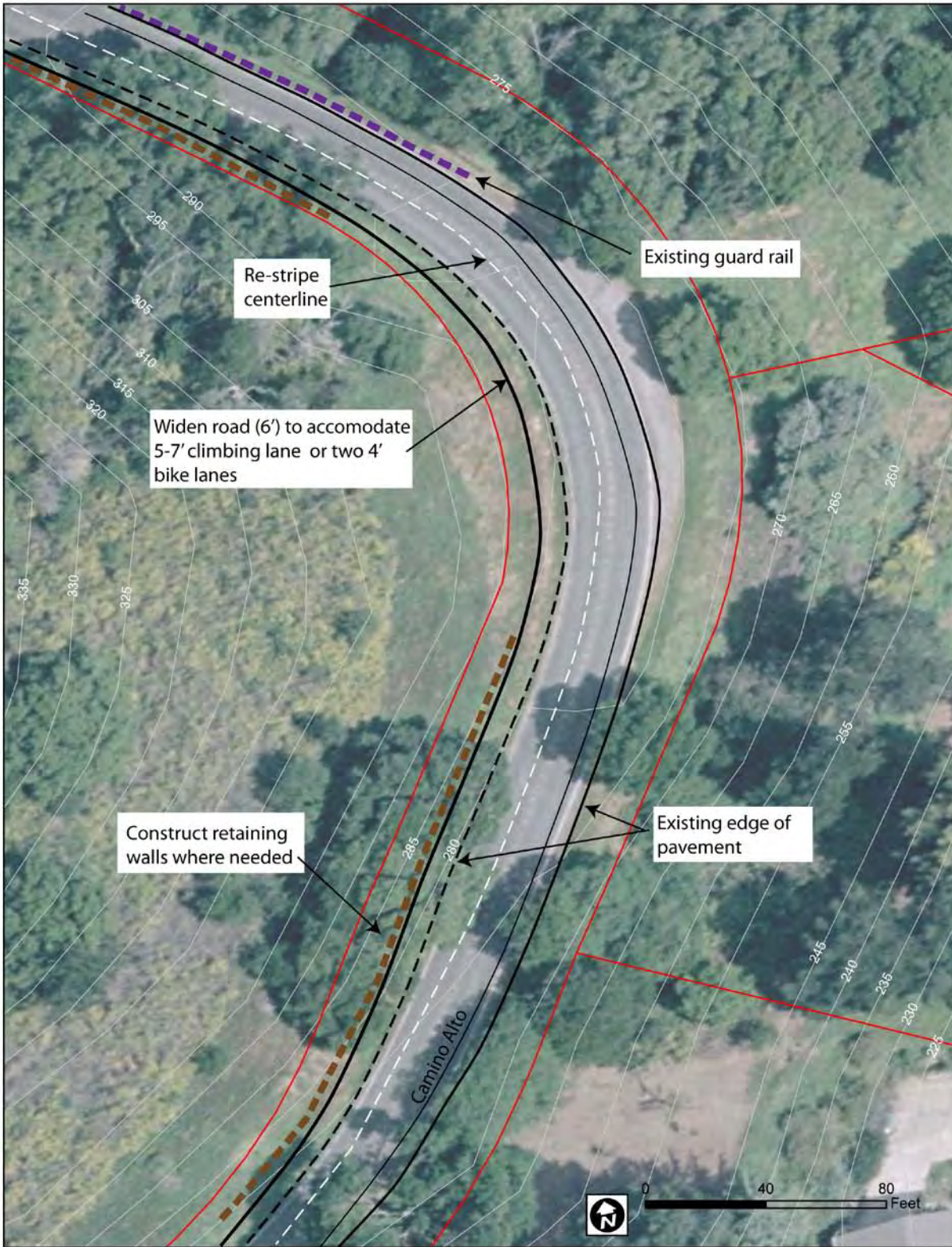


Figure 2-38: Camino Alto Improvements between Overhill Road and City Limits

Segment 13A:

Along Corte Madera Avenue from the Mill Valley/Corte Madera city limit, near Chapman Drive, to the open space preserve boundary and beginning of the existing pedestrian path on west side; 2570', .5 miles; Corte Madera jurisdiction and road right-of-way.

Issues: (discussed in detail in Route overview and Segment 12A description)

- Bicycle conflict with vehicular traffic. Corte Madera Avenue is narrow and winding, passing through steep terrain, with an approximately 24' wide roadway and 0' to 3' paved shoulders.
- Bicycle access – uphill climbing lane. The Town of Corte Madera Bicycle Plan calls for a climbing lane on Corte Madera Avenue. Due to steep topography, trees, driveways and structures near the roadway, it would be feasible to add only one 4 – 5 foot climbing lane and not two bike lanes or one wider climbing lane as is envisioned on Camino Alto.
- Pedestrian access; existing and potential pedestrian usage – Extension of the existing pathway that terminates at the north end of this segment would be a significant project, involving traversing slopes ranging from 2:1 to as steep as 1:1 or more. Creating space for a parallel sidewalk or pedestrian path would require much higher and more extensive retaining walls, and a corresponding increase in the removal of native trees and other vegetation. It is assumed that the relatively low existing and projected pedestrian use does not justify the cost and impact of a separate sidewalk or path. The climbing lane or bike lane improvements will provide some informal improvement for pedestrian access.
- Drainage improvement.
- Adjacent land use – There are no immediately adjacent structures, but there are approximately six residential driveways on the east side toward the north end.
- Native trees and vegetation within the right-of-way - this segment is primarily oak woodland bordered by open space.

Improvement Concepts:

The entire segment could be widened by an increment of 2 to 5 feet to provide an uphill climbing lane on the west side. Approximately one third, or 850 l.f., has sufficient relatively level space to widen with minor grading. Approximately two thirds, or 1,700 l.f. would require a retaining wall either on the west/uphill side of the road or on the downhill/east side of the road to widen. Specific improvement elements could include:

- Trimming and clearing of vegetation (including removal of approximately 6 mature oaks and redwoods).
- Grading, cut and fill for widening and retaining walls.
- Retaining walls – approximately 2' to 6' high, average of 4'.
- Modifications to approximately six driveways that connect to the widened road.
- Extend 4 existing culverts and provide new inlet on uphill side, or discharge structure on downhill side.
- A.C. paving, approximately 4 feet additional width.
- Re-stripe centerline and shoulders for a climbing lane. To allow bikes to reach speed to share the downhill lane with traffic, the climbing lane should continue beyond the crest of the hill into segment 13A, overlapping with the climbing lane extending south from 13A on the west side.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: **\$761,000**



Segment 13A Improvement Concepts
(see page 2-1 for Master Map Legend)

Figure 2-39

Segment Location Map



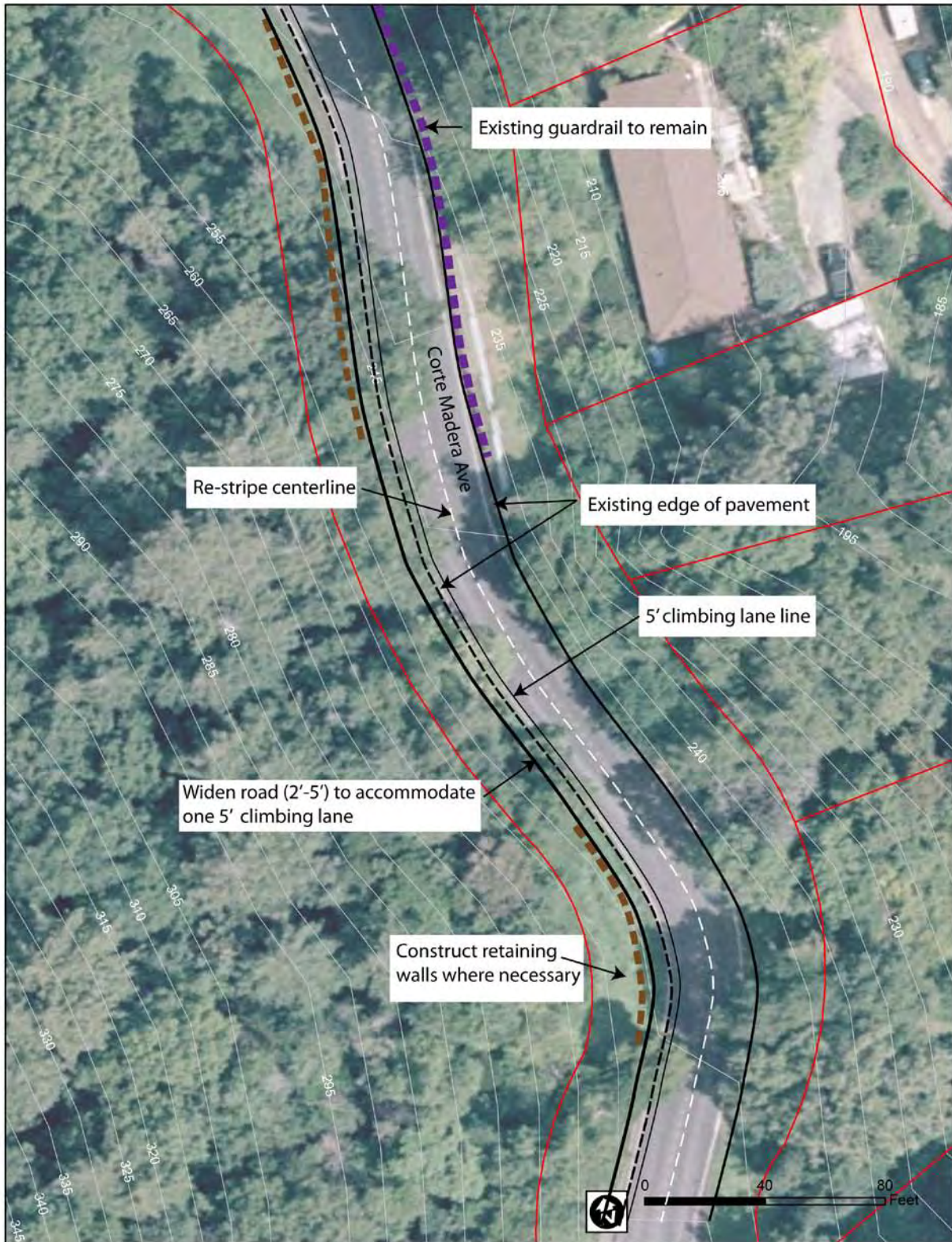


Figure 2-39: Southern Portion of Corte Madera Avenue Improvements

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Segment 13B: Along Corte Madera Avenue from the open space preserve boundary and beginning of the existing pedestrian path on the west side to Redwood Avenue, and along Redwood Avenue to Montecito Drive; 2,710', 0.5 miles; Corte Madera jurisdiction and road right-of-way.

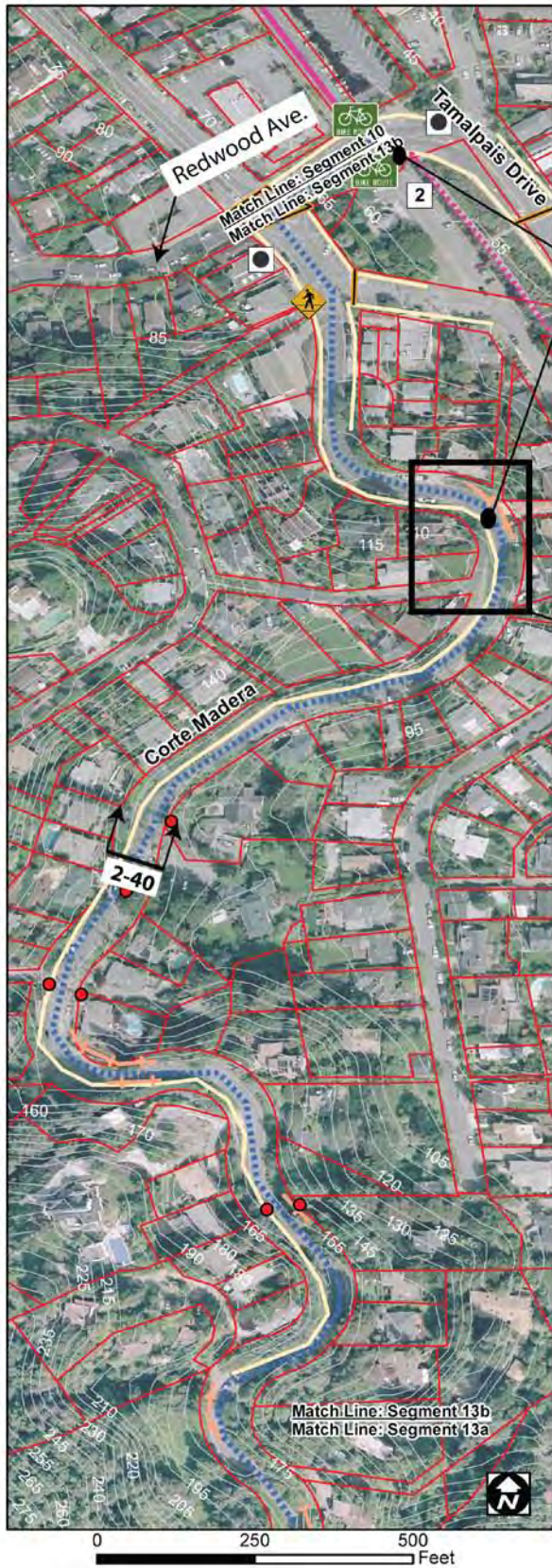
Issues: (discussed in detail in Route overview and Segment 13A description)

- Bicycle conflicts with vehicle traffic - this segment of Corte Madera Avenue is similar to 13A – a narrow and winding, passing through steep terrain, with an approximately 24' wide roadway and 0' to 3' paved shoulders.
- Bicycle access – climbing lane or bike lanes. A modest pavement widening by an increment of 2 to 5 feet could provide a 5'-wide uphill climbing lane for bikes on the east side without major changes to adjacent private improvements, and with minimal loss (e.g. 2 to 3 spaces) of the approximately 12 roadside parking spaces that exist along this portion.
- Pedestrian access – The existing pedestrian path is approximately 4' wide. It is interrupted in some places, and the materials, width and condition vary. Improvement or reconstruction of the path would greatly improve access. It is assumed that any shoulder widening that replaced the existing east side pathway is not desirable, and that a paved shoulder would be a less desirable facility for pedestrians because the existing path is separated from the road by curbs, grades, and trees in some cases.
- Drainage improvement requirements.
- Impact on adjacent land use – This segment is flanked by houses on both sides and many driveways, shoulders used for parking, and walls, fences and landscaping in the right-of-way. Improvements would need to be carefully designed given existing private improvements, including approximately 30 driveways.
- Native trees and vegetation within the right-of-way.

Improvement Concepts:

- Trimming and clearing of vegetation (some small bays and oaks, one large bay, and one large redwood may need to be removed).
- Grading, cut and fill for widening and retaining walls.
- Retaining walls – approximately 1' to 3' high, average of 2', in selected locations on approximately half of the 2,200 l.f. steep portion of the segment.
- Modifications to approximately 30 driveways to conform to the widened road and/or path.
- Extend 4 existing culverts and provide new inlet on uphill side, or discharge structure on downhill side.
- Add A.C. paving, approximately 3 feet additional width, average.
- Re-stripe centerline and shoulders for a bike climbing lane. To allow bikes to reach speed to share the downhill lane with traffic, the climbing lane should continue beyond the crest of the hill into segment 12B, overlapping with the climbing lane extending north from 12B on the east side.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.
- Reconstruct/improve existing A.C. or concrete path.

Along the last 500 feet of the segment on Corte Madera Avenue, the roadway straightens, widens to 38 feet, and has sidewalks on both sides. There are striped shoulders outside of curbside parking, providing marginal space for bikes – approximately 10' feet total, rather than the 12' recommended for combined parking/bike lanes. Potentially the traffic lanes could be narrowed to provide the space for bike lanes, or an uphill climbing lane added on the east side.



Segment 13B Improvement Concepts
(see page 2-1 for Master Map Legend)

Reconstruct existing informal path/sidewalk in this section

Figure 2-41

Segment Location Map



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The route then turns east along Redwood Avenue. Specific improvement elements for this portion include:

- Re-stripe centerline and shoulders for bike lane or an uphill climbing lane.
- Additional traffic control and warning signs, route wayfinding signs, and milepost signs.

Improvement Cost: \$877,000

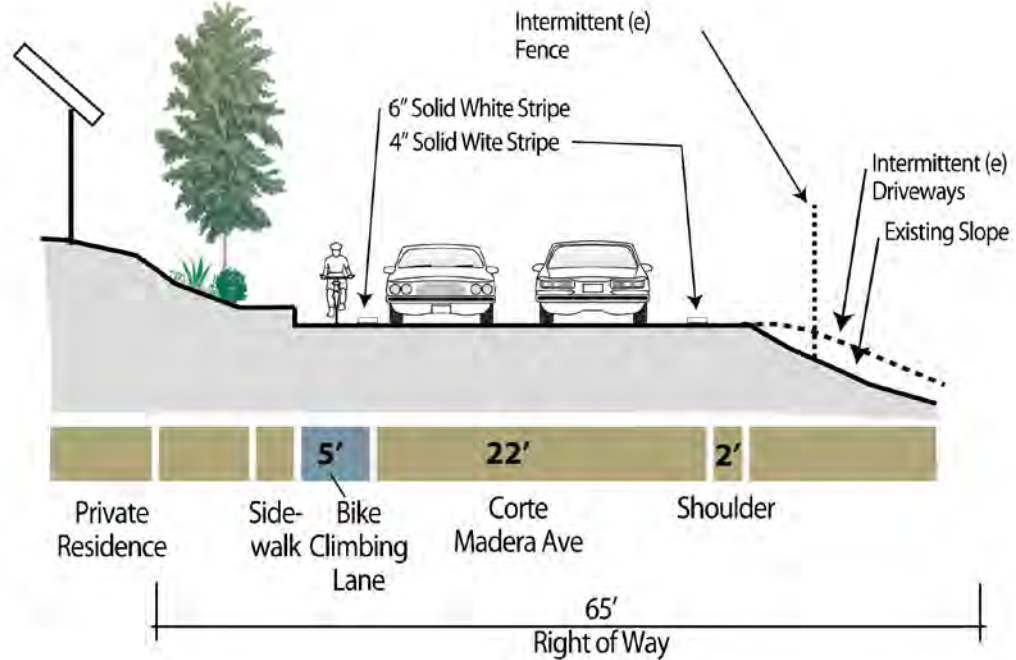


Figure 2-40 Section through Corte Madera Avenue

Note: Right-of-way widths are approximate, per Marin County GIS data, and vary along the route

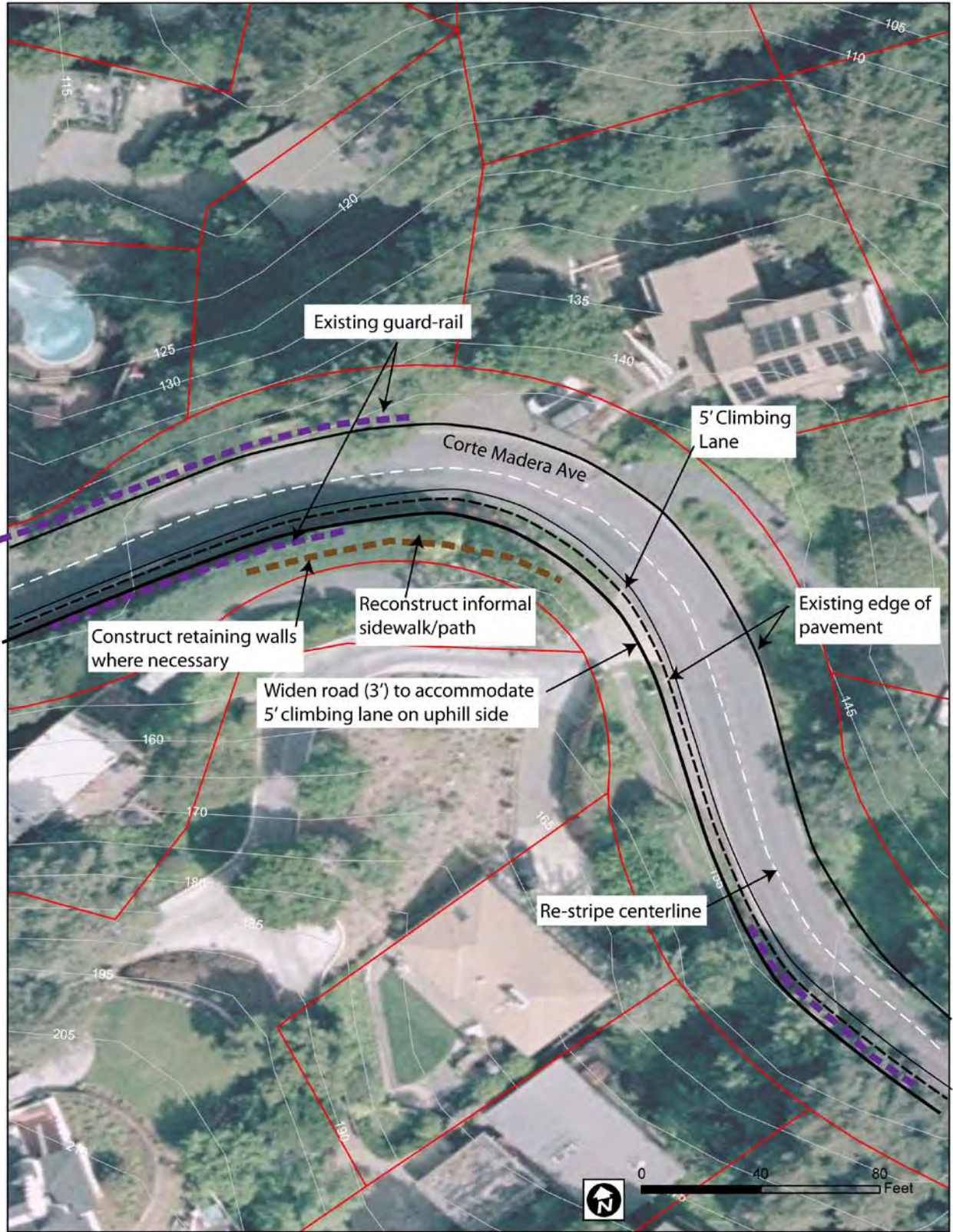


Figure 2-41: Northern Portion of Corte Madera Avenue Improvements

Segment 10: Connection along Montecito Drive north of Redwood Avenue to the existing Sandra Marker Trail, and along the Sandra Marker Trail north and east to Tamal Vista Boulevard at Wornum Way; 6,638' / 1.4 miles.

(see Route B, Alto Tunnel, for description of Segment 10 improvements)

3 Alternatives Evaluation

This section summarizes and contrasts the trail route alternatives against each other. It includes a matrix format that facilitates comparison. The objective of the evaluation is not to select a preferred alternative, but to highlight the features and relative advantages and disadvantages of each alternative route. The evaluation criteria, and the tentative conclusions, reflect comments from the public and Technical Advisory Committee members during the course of the Study. The conceptual improvements for each route alternative were developed to address these criteria to the extent feasible. The evaluation reflects the performance of the alternatives assuming the recommended and optional improvements are implemented as described in Section 2.

3.1 Profiles

Profiles (cross-sections following the terrain of the route) were prepared to show the relative slope gradients of the three alternative routes, plus the Casa Buena sub-alternative of the Horse Hill Route (Figure 3-1), and compare them to grades of other bike routes in Marin County (Figure 3-2). The vertical scale is exaggerated to highlight the elevation changes. These profiles show that the Alto Tunnel Route has less than half the elevation gain of the Horse Hill Route, and the Camino Alto/Corte Madera Avenue Route has four times the elevation gain of the Alto Tunnel Route, or twice that of the Horse Hill Route.

The Cal Park Tunnel Route has a similar elevation gain to the Alto Tunnel Route, but steeper approaches. Other Marin County routes have less elevation gain than the Camino Alto/Corte Madera Avenue Route, but have much steeper gradients.

Figure 3-1: Profiles of Study Routes

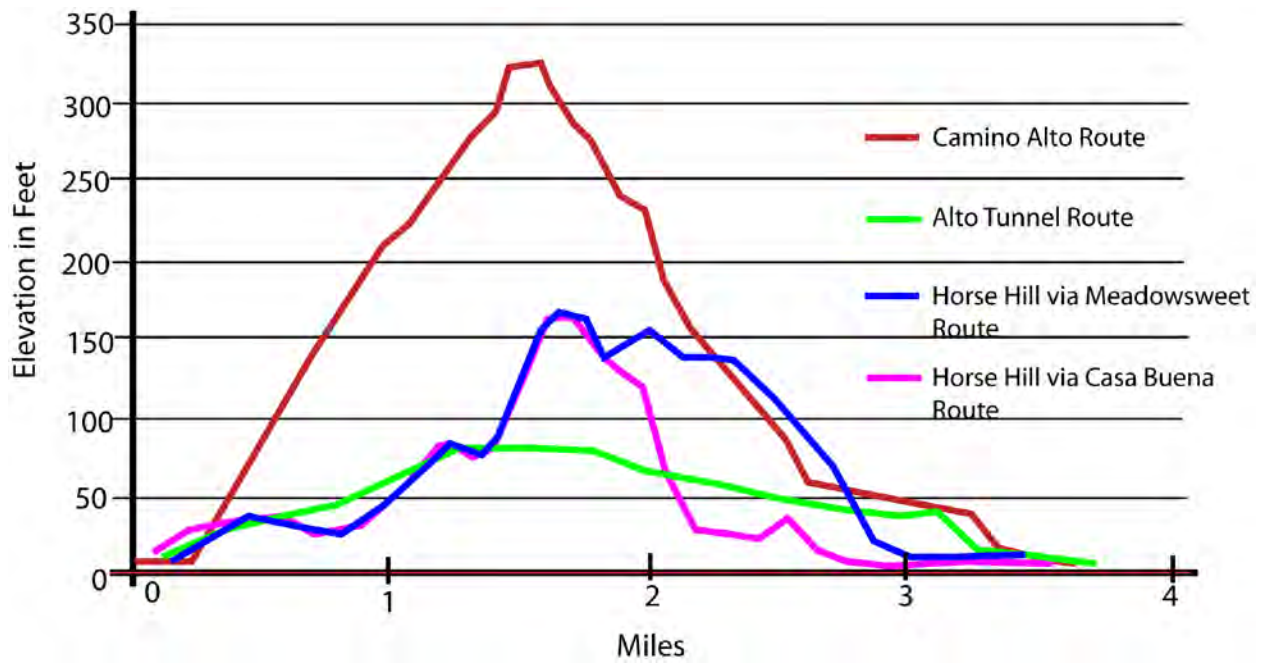
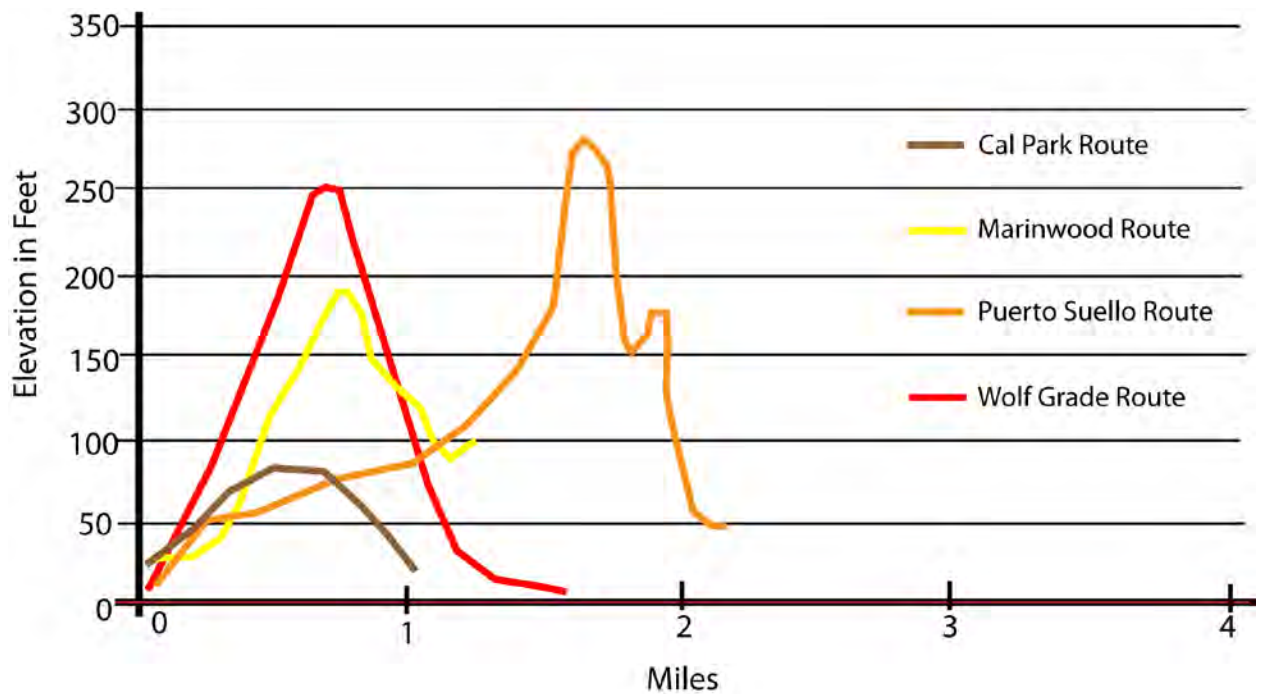


Figure 3-2: Profiles of Other Marin County Routes



3.2 Evaluation Criteria

Based on input during the first stage of the Study, the evaluation criteria were refined to consist of the following (not listed in particular order):

- **Emergency Access and Safety**
Ability to meet the requirements of local emergency agencies to respond to fire, police or medical emergencies on the route and provide the safety and security features identified.
- **Bikeway and Community Connections**
Direct and convenient access to other routes and destinations, paths or bikeways, schools, parks, commercial or employment areas.
- **Functionality/Efficiency**
Function for the intended and likely user groups, based on adopted local, state or federal design criteria, and ability to address potential conflicts between user groups.
 - Bicyclists
 - Pedestrians
 - Persons with disabilities
- **Mode Shift/Use Levels**
The relative increase in travel by bicyclists and pedestrians compared to current conditions, as estimated in the Use Counts and Projections, Appendix H.
- **Roadway Crossings and Intersections**
Need for road crossings by bicyclists and pedestrians and ability to configure the intersections for safe and efficient crossing.
- **Right-of-Way Availability/Issues**
Requirements to secure additional right-of-way and/or agreements from other parties to complete the path improvements.
- **Possible Environmental Issues**
Possible issues related to geologic stability, storm drainage, biological or cultural resources, aesthetics, noise, water quality, or other factors typically addressed during the CEQA or NEPA process.
- **Adjacent Property Issues**
Issues related to path construction or users on adjacent properties and conceptual feasibility to address these issues.
- **Cost**
The relative cost of implementation of the alternatives – including studies, planning, final design permitting, acquisition, and construction. The evaluation will also consider the relative certainty of the estimated cost based on available information.

- **Cost per Projected User**

The cost of improvements divided by the projected number of users – the latter number being an estimate based on national trends and current use of nearby bicycle and pedestrian facilities.

- **Permitting Requirements:**

Potentially required permits from State and Federal agencies, the likelihood of obtaining permits, and the impact on cost and schedule

- **Consistency with Local Plans**

Consistency of the alternative alignments with previously-adopted County or city plans and policies.

- **Maintenance and operation requirements**

The relative requirements and feasibility of maintaining and managing the facility, including ability of the responsible party(ies).

3.3 Input Regarding Criteria

Comments during public participation recommended the use of criteria from the 2008 *Marin County Unincorporated Bicycle and Pedestrian Master Plan* to evaluate the feasibility of use of the Alto Tunnel. These criteria are taken in turn from a 2001 the Rails-to-Trails Conservancy study, *Tunnels on Trails*, a survey of 78 tunnels in use as bikeways on 36 trails in the United States. As stated in the *Master Plan*:

According to this report and based on criteria specific to Marin County, the feasibility of reusing any of the tunnels is dependent on several factors, including:

1. The willingness of local jurisdiction(s) to become project sponsor(s) and take on the cost and responsibility of building and operating the facility
2. The political acceptability to local neighborhoods of these renewed corridors provided by re-opened tunnels
3. The lack of reasonable, less costly alternatives
4. The expectation that they will significantly increase bicycling and walking
5. Geological, drainage, or other physical factors posed by the reopening of tunnels
6. Ability of project sponsoring agencies to resolve legal issues with affected property owners
7. Cost of re-construction and available funding
8. The ability to address safety and security issues

Factors 1 and 2 above are input and decision processes that will follow the completion of this technical study. Factor 6 cannot be determined until the process recommended in the study to address right-of-way issues is completed, but the issue is framed in the analysis and evaluation. The other factors are all included in the evaluation criteria.

In December 2000 the Mill Valley City Council passed resolution 00-36, supporting a tunnel feasibility study and recommending 11 specific issues to be addressed:

1. The manner in which the tunnel construction, operations and maintenance costs will be financed, along with identification of possible funding, and a cost/benefit analysis be prepared utilizing these cost figures.
2. The extent to which the tunnel and the approaches thereto can be constructed and maintained so as to be non-invasive to privacy and safety of the neighboring residents during both construction and operation.
3. Analysis of the tunnel structure including seismic safety of the tunnel and adjoining properties;
4. Analysis of the likely ongoing costs of maintenance, lighting and security and the impact of these costs on the city;
5. The extent to which construction of the tunnel is likely to delay or diminish completion of the specific local and regional projects benefiting the City and surrounding areas, as listed in the Marin County Bicycle and Pedestrian Master Plan;
6. Evaluation of the adequacy of the current multi use path in Bayfront Park for the expected increased volume of bike riders, and users of the park;
7. Evaluation of the effect of the tunnel on the existing and anticipated traffic congestion problems in Marin County in general and the city in particular;
8. Whether reestablishment of the Alto Tunnel might result in its use in connection with train service in southern Marin County (which would be counter-productive to bicycle and pedestrian use) and;
9. Evaluation of whether alternatives to the tunnel, including the improvement of the existing route on Camino Alto, the path adjacent to U.S. highway 101, and other possible north/south routes, may contribute sufficient improvement to bicycle/pedestrian travel and traffic flow without the addition to the tunnel.
10. Proposed schedule for design, funding, construction and opening.
11. Identification of the environmental impacts of the proposed tunnel on the surrounding areas, including the need for any possible easement or property acquisition.

The current study addresses the above issues at a general level consistent with a preliminary engineering study, except for the following issues:

Issue 1 – How the tunnel improvements will be financed is not specifically resolved in the study, although it does identify potential funding sources. It provides cost/benefit considerations.

Issue 5 – Regarding the impact of the project on competing projects. This depends on funding opportunities.

Issue 8 – Potential use of the re-opened tunnel for train service is also beyond the scope of the current study to address.

3.4 Evaluation Matrix

The evaluation in Table 3-1 is a summary of very complex issues and conclusions based on the opinion of the technical study team. The evaluation summarizes relative performance of each alternative against each criterion in subjective terms of Excellent, Good, Fair, or Poor. In some cases there are mixed results, or clarifications of the conclusion.

Table 3-1: Route Alternatives Evaluation Matrix

Route Alternatives Performance			
Criteria	Horse Hill Route	Alto Tunnel Route	Camino Alto/Corte Madera Ave Route
Emergency Access and Response	Good. except along the Horse Hill Path. Concepts to widen path would improve access.	Fair. Tunnel would present access challenges for emergency personnel, partially mitigated by safety improvement concepts. Tunnel would provide a new emergency egress route between communities.	Excellent. All portions are along public roads.
User/Public Safety – separation from traffic	Good. Separated from traffic or on low volume roads, but Sanford and Madera Street intersection is challenging.	Good. Entirely separated from roads if Montecito pathway improvements are implemented, but mixing user types in tunnel is a concern, as is sense of personal safety.	Fair. All portions are along busy, winding, narrow public roads, but widening will significantly improve safety from current.
Bikeway and Community Connections	Good. A less direct route from central Mill Valley to central Corte Madera, but connects directly to Town Center shopping area and to improvements planned in the Highway 101 Twin Cities Corridor Study by TAM.	Excellent. A direct, virtually flat link between the two most popular pathways in the County, and between central MV and CM.	Fair. Links central MV and CM, but a longer, winding route.
Functionality/ Efficiency – Bicycles	Fair. Involves two steep hills of 10% and 8% slope. A longer and less direct route. Exposure to freeway traffic noise, view and nighttime glare. May be partially addressed by improvements.	Good. Flat and relatively straight. Potential conflict with other users in the tunnel, aesthetic and safety concerns may deter some users.	Fair. Involves climbing a steep hill and mixing with cars on a winding road. Even with climbing lanes or bike lanes some bicyclists would feel uncomfortable on this route. But scenic and challenging for avid bicyclists.

Route Alternatives Performance			
Criteria	Horse Hill Route	Alto Tunnel Route	Camino Alto/Corte Madera Ave Route
<p>Functionality/ Efficiency –</p> <p>Pedestrians/ Persons with disabilities</p>	<p>Poor/Fair. Southern and northern portions have sidewalks or path and low gradients. Horse Hill Path and part of Casa Buena have steep grade. Southern Meadowsweet and Casa Buena lack sidewalk or path, and use patterns and adjacent land uses and resources do not support adding pedestrian improvements.</p>	<p>Good. Excellent relative to gradient and surface, but potential conflicts with bikes in tunnel and concerns about personal comfort and perceived safety in the tunnel pertain.</p>	<p>Poor. A steep route exposed to heavy traffic with discontinuous sidewalks and path. Extension of sidewalk on Camino Alto north to Overhill and improvements to Corte Madera Avenue path would improve access on those portions, but not through access. Use patterns and adjacent land uses and resources do not support adding pedestrian improvements.</p>
<p>Mode Shift/Use Levels</p>	<p>Fair. An estimated 10% increase in use due to limited ability to improve existing route conditions, and current relatively low popularity.</p>	<p>Excellent. Estimated use and vehicle miles travelled savings approximately five times the projected level for Horse Hill Route, and twice the level for Camino Alto/Corte Madera Ave. Route, based on capturing 50% of users of adjacent existing paths.</p>	<p>Good. An estimated 25% increase in use, primarily by bicyclists, on this already popular route, due to potential significant improvement in safety and conflict with vehicles.</p>
<p>Roadway Crossings and Intersections</p>	<p>Fair. Most of route avoids major crossings, but conflicts at freeway on-ramp on Casa Buena, and complex intersection at Sanford Street.</p>	<p>Excellent. Crossings at E. Blithedale and Redwood Avenue comparable to other 2 routes; only other crossing is Vasco Court.</p>	<p>Fair. Crossing at and connection from E. Blithedale and at Redwood Ave. could be improved, no other major road crossing issues, but many intersecting roads .</p>

Route Alternatives Performance			
Criteria	Horse Hill Route	Alto Tunnel Route	Camino Alto/Corte Madera Ave Route
Right-of-Way Availability/ Issues	Good. Requires Caltrans permission, permit to make improvements on Horse Hill path.	Poor. Parts of the route in a variety of ownerships. Requires significant study and negotiation process to resolve.	Fair. Involves changes to private improvements in the R.O.W., as noted under Adjacent Property Issues. Limited available ROW for improvements requires careful design
Environmental Issues	Good. Changes to grassland and scrub if Horse Hill Path widened, Meadowsweet connection implemented. Potential cultural resources and hazardous materials (along Highway 101) constraints. Construction noise and activity.	Poor. Removal of native trees and vegetation along the right of way near tunnel portals, construction in wet area habitat, potential soil contamination along rail route. Geologic and hydrologic considerations. Construction noise and activity, and safety and community impacts to be assessed. Potential cultural resources constraints.	Fair. Changes to adjacent hillsides by path widening – removal of trees, shrubs, grassland adjacent to open space, visual changes with retaining walls. Potential cultural resources and regulatory waters constraints. Construction noise and activity.
Adjacent Property Issues	Fair. Major bike route passing Maguire Elementary School campus a concern. May be concerns about impact on freeway.	Poor. Improvements and introduction of up to 850,000 annual users a significant change to the character of the neighborhoods to the south and north of the tunnel portal. Construction noise and activity will affect.	Good/Fair. Construction noise and activity will affect, but no lasting impact on adjacent properties on southern 3/4 of route. Localized changes in neighborhoods along Corte Madera Avenue, loss of some parking.
Cost	Good/Fair. \$4.4 - \$5.5 million Route 4A or 4B Sunken Path Option \$9 - \$10.2 million E. Blithedale Separated Crossing: <u>add</u> \$3.4 - \$4 million	Poor. \$48 - \$52 million E. Blithedale Separated Crossing: <u>add</u> \$3.4 - \$4 million	Good. \$4.6 million With sidewalk extension to Overlook Road: \$5.5 million E. Blithedale Separated Crossing: <u>add</u> \$3.4 - \$4 million

Route Alternatives Performance			
Criteria	Horse Hill Route	Alto Tunnel Route	Camino Alto/Corte Madera Ave Route
Permitting and Agreement Requirements	Fair. Requires Caltrans permission, permit to make improvements on Horse Hill path.	Poor. Requires delineation of potential wetlands, permits from state and federal environmental agencies, agreement between County and two cities.	Fair. Requires delineation of potential wetlands/drainages and/or permits from state and federal environmental agencies. Otherwise requires only approval of Mill Valley and Corte Madera.
Consistency with Local Plans	Undetermined. Listed as an option in Co. Unincorporated Area Bike and Ped. Master Plan, but not in City plans. Lomita portion is in unincorporated area. Part is an adopted County bike route.	Good. Incorporated in adopted bicycle plans. Adopted plans direct current study.	Good. Consistent with County, Mill Valley, and Corte Madera adopted bicycle and pedestrian plans.
Maintenance and Operation Requirements	Good/Fair. Basic improvements primarily additions and modifications to existing facilities, but Sunken Path option brings added maintenance (drainage; retaining walls long-term maintenance responsibility).	Poor. Tunnel and connecting pathways, drainage facilities, and tunnel safety and emergency features would be a large operation and maintenance responsibility.	Fair. Primarily additions and modifications to existing road and drainage facilities, but extensive retaining walls would be a long-term maintenance responsibility.

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4 Cost Estimates

This section provides planning-level cost estimates for the alternative route improvement concepts, including planning, design, construction, and other anticipated implementation costs, as well as maintenance costs.

4.1 Construction Costs

Costs for the Alto Tunnel rehabilitation and the drainage improvements associated with the tunnel portals were estimated separately in the respective technical studies, and are summarized here.

Like the improvement concepts themselves, the cost estimates required assumptions about the methods of construction and associated requirements. The estimate and assumptions reflect the experience of the consultant team with other similar projects.

The individual segment estimates (Table 4-2 and Appendix L) include cost “placeholders” for each stage of project implementation, based on factors of the construction cost, including:

- Survey, technical studies (such as geotechnical or hazardous waste investigations) and design (including preliminary and final plans, cost estimates, and specifications/bid forms) – 15%
- Environmental analysis and documentation and related permits – 10%
- Project administration during planning, design and construction – 10%
- Construction overhead (costs the contract typically includes over and above the individual work items, such as mobilization and general conditions) – 10%

A contingency for the level of accuracy of the estimate is included at 20% of all items, except for the Alto Tunnel, which is at 40%.

Specific cost allowances are added to the standard cost factors for tasks or items that are unique to some segments.

If small improvement projects are undertaken separately, the costs may potentially increase significantly from the design, administration and construction cost factors in the estimates. In any case, actual costs for the projects can only be determined following development of more complete and detailed base information and definition of the specific improvements for design, environmental review and permitting, and construction.

Table 4-1: Route Improvements Planning-Level Estimates

A Horse Hill Route				
Length - Segment 4A option (Meadowsweet):		15,570 feet/2.9 miles		
Length - Segment 4B option (Casa Buena):		15,330 feet/2.9 miles		
Total estimated cost:			Path widening & route improvements <u>without</u> sunken path option	Path widening & route improvements <u>with</u> sunken path option
<u>Without</u> E. Blithedale bike/ped O/U Crossing	Using Segment 4A		\$4,369,778	\$9,046,321
	Using Segment 4B		\$5,514,939	\$10,191,482
<u>With</u> E. Blithedale bike/ped O/U Crossing	Using Segment 4A		\$7,777,778	\$12,454,321
	Using Segment 4B		\$8,922,939	\$13,599,482
B Alto Tunnel Route				
<i>(route is longer than A because it includes segment 10, Sandra Marker Trail)</i>				
Length: 16,620 feet/3.1 miles				
Total estimated cost:				
<u>Without</u> E. Blithedale bike/ped O/U Crossing		Low Range	\$48,253,660	\$51,661,660
		High Range	\$56,095,893	\$59,503,893
C Camino Alto/Corte Madera Avenue Route				
<i>(route is longer than A because it includes segment 10, Sandra Marker Trail)</i>				
Length: 19,430 feet/3.7 miles				
Total estimated cost:			Adding bike and/or climbing lanes <u>without</u> sidewalk extension to Overhill Rd.	Adding bike and/or climbing lanes <u>with</u> sidewalk extension to Overhill Rd.
<u>Without</u> E. Blithedale bike/ped O/U Crossing			\$4,644,473	\$5,465,647

Note: Costs include these items and assumptions:

- Construction overhead (e.g. mobilization and general conditions) – 10% of construction cost.
- Survey and technical studies – 15% of construction cost.
- Environmental analysis and documentation and related permits – 10% of construction cost.
- Project administration during planning, design and construction – 10% of construction cost.
- Contingency for level of estimate accuracy – 20% of all items.
- Specific cost allowances for tasks or items unique to some segments.

Table 4-2: Segment Improvements Planning-Level Estimates

(see Figure 1-2 for segment locations)

Horse Hill Route			
	Length - Segment 4A option (Meadowsweet):	15,570 feet/2.9 miles	
	Length - Segment 4B option (Casa Buena):	15,330 feet/2.9 miles	
		Without Sunken Path Option	
Total estimated cost:	Without E. Blithedale Bike/Ped O/U Crossing	\$4,369,778	Using Segment 4A
		\$5,514,939	Using Segment 4B
	With E. Blithedale Bike/Ped O/U Crossing	\$7,777,778	Using Segment 4A
		\$8,922,939	Using Segment 4B
Segment 11A	E. Blithedale Avenue crossing improvements from northern end of Mill Valley Sausalito Path at Lomita Avenue.		
	Length:	100 feet/0.02 miles	
	Total Cost:	\$84,067	
E. Blithedale Bike/Ped O/U Crossing Option (add):	\$3,408,000		
Segment 1	Functions as part of Alto Tunnel & Horse Hill route. From the northern end of Mill Valley-Sausalito Path to Vasco Court.		
	Length:	3,700 feet/0.7 miles	
	Total Cost:	\$926,325	
Segment 2A	From bike path at Edna Maguire Elementary School along Lomita Road to Greenfield Court.		
	Length:	1,550 feet/0.3 miles	
	Total Cost:	\$90,440	
Segment 2B	From Greenfield Court along Lomita Road to Horse Hill bike path.		
	Length:	1,830 feet/0.35 miles	
	Total Cost:	\$486,332	
Segment 3	Existing Class I bike path running from end of Lomita Drive parallel to Highway 101 to Meadowsweet Drive.		
	Length:	2,040 feet/0.4 miles	
	Total Cost:	\$2,301,606	

Horse Hill Route (Continued)

Segment 4A South	From the northern end of the Horse Hill path along Meadowsweet Drive to Conow Street.			
Length:	4,270 feet/0.8 miles			
Total Cost:	\$41,116			
Segment 4A North	Meadowsweet Drive from Conow Street to Sanford Street			
Length:	1,640 feet/0.3 miles			
Total Cost:	\$5,692			
Segment 4B South	(Alternative to Segment 4a South above): Casa Buena Drive from northern end of Horse Hill path to Conow Street			
Length:	3,780 feet/0.7 miles			
Total Cost:	\$1,160,816			
Segment 4B North	(Alternative to Segment 4a North above): Casa Buena Drive from Conow Street to Sanford Street			
Length:	1,890 feet/0.4 miles			
Total Cost:	\$31,153			
Segment 5	Intersection - Sanford Street from Meadowsweet Drive to Tamalpais Drive			
Length:	60 feet/0.01 miles			
<i>Construction Items: to be scoped and estimated as part of Highway 101 Greenbrae/Twin Cities Corridor Improvements Study</i>				
Segment 6	From Tamalpais Drive to Wornum Way along Madera Boulevard and Tamal Vista Boulevard to the study end point.			
Length:	3,630 feet/0.7 miles			
<i>Construction Items: to be scoped and estimated as part of Highway 101 Greenbrae/Twin Cities Corridor Improvements Study</i>				

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Alto Tunnel Route				
Length:	16,620 feet/3.1 miles			
Total estimated cost:				
	<u>Without</u> E. Blithedale Bike/Ped Bridge	\$48,253,660	Low	\$56,095,893
	<u>With</u> E. Blithedale Bike/Ped Bridge	\$51,661,660	Low	\$59,503,893
Segment 11A	E. Blithedale Avenue crossing improvements from northern end of Mill Valley Sausalito Path at Lomita Avenue.			
Length:	100 feet/0.02 miles			
Total Cost:	\$84,067			
E. Blithedale Bike/Ped O/U Crossing Option (add):	\$3,408,000			
Segment 1	Functions as part of Alto Tunnel & Horse Hill route. From the northern end of Mill Valley-Sausalito Path to Vasco Court.			
Length:	3,700 feet/0.7 miles			
Total Cost:	\$926,325			
Segment 7	Old railroad bed running from Vasco Court to Alto Tunnel.			
Length:	1,280 feet/0.2 miles			
Total Cost:	\$1,411,809			
Segment 8	Alto Tunnel and Portals			
Length:	2,250 feet/0.4 miles			
Total Cost:		Low \$42,895,597	High	\$50,737,830
Segment 9A	From northern end of Alto Tunnel to Montecito Avenue and beginning of existing path near Tamalpais Drive.			
Length:	2,310 feet/0.4 miles			
Total Cost:	\$2,555,968			
Segment 9B	Along RR row from Montecito Avenue and beginning of existing path near Tamalpais Drive to the south side of Redwood Avenue.			
Length:	690 feet/0.1 miles			
Total Cost:	\$215,697			

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Camino Alto/Corte Madera Avenue Route			
Length:	19,430 feet/3.7 miles		
	Total estimated cost:	Without Sidewalk Extension to Overhill Rd.	With Sidewalk Extension to Overhill Rd.
	Without E. Blithedale Bike/Ped O/U Crossing	\$4,644,473	\$5,465,647
	With E. Blithedale Bike/Ped O/U Crossing	\$8,052,473	\$8,873,647
Segment 11	Short connection along E. Blithedale Avenue from northern end of Mill Valley Sausalito Oath to El Camino Alto.		
Length:	570 feet/0.1 miles		
Total Cost:	\$84,067		
E. Blithedale Bike/Ped O/U Crossing Option (add):	\$3,408,000		
Segment 12A	Along Camino Alto from E. Blithedale Avenue to Overhill Road.		
Length:	3,430 feet/0.7 miles		
Total Cost:	\$1,393,898		
Segment 12B	Along Camino Alto Road from Overhill Road to Mill Valley/Corte Madera city limit.		
Length:	3,850 feet/0.7 miles		
Total Cost:	\$1,365,172		
Segment 13A	From Mill Valley/Corte Madera city limit to Open Space boundary and start of pedestrian path		
Length:	2,570 feet/0.5 miles		
Total Cost:	\$760,575		
Segment 13B	From Open Space boundary and start of pedestrian path to Redwood Avenue, and along Redwood Avenue to Tamalpais Drive		
Length:	2,710 feet/0.5 miles		
Total Cost:	\$876,563		

4.2 Operations and Maintenance Costs

Requirements for management, maintenance, and operation of the alternative routes are an important consideration for future decisions about what improvements to undertake. A well-designed program of maintenance and operation can encourage the use of the facilities and deter problems such as vandalism and littering. Such a program requires a realistic level of funding

Depending on the type of improvements, different levels of funding are necessary to address items such as pavement stabilization, landscape maintenance, facility upkeep, sign replacement, fencing, mowing, litter removal, painting, and pest control. Maintenance-related design objectives for any new facilities include:

- Provide an adequate pavement structural section to support maintenance vehicles on the paths of the Horse Hill route and the paths leading to the Alto Tunnel as well as the bike lanes of the Camino Alto/Corte Madera Ave route;
- Provide vandal-proof lighting for the Tunnel and features of the other routes such as the guard rail on the Camino Alto/Corte Madera Avenue Route, that minimize maintenance needs;
- Provide adequate fencing and other access control to the path routes to minimize trespassing.
- Provide adequate informational, traffic control, regulatory, and wayfinding signage.

Meeting these objectives and providing a thorough ongoing maintenance program will benefit the basic physical, aesthetic, and biological qualities of the route, and result in many other benefits in as listed below:

- A high standard of maintenance is an effective way of helping advertise and promote the facility as a local and regional transportation and recreational resource;
- The psychological effects of good maintenance can be a deterrent to vandalism, litter, and encroachments;
- Good maintenance is necessary to preserve positive public relations between the adjacent land owners and between public agencies;
- Good maintenance can help make enforcement of regulations on the route more efficient. Local clubs, interest groups, and neighbors will take pride in the facility and will be more apt to assist in its protection;
- A proactive maintenance policy will help improve safety;
- Regular, routine maintenance on a year-round basis will prolong the life of the facility.

Maintenance Cost

Maintenance costs for the bicycle and pedestrian connection between Mill Valley and Corte Madera will depend on the facility type. Maintenance costs are most expensive for separate bike paths and tunnels followed by on-street bicycle lanes and then the least expensive facilities to maintain are on-street bicycle routes. Whereas tunnels and off-street paths require separate maintenance schedules, maintenance of on-street bikeways occur with normal roadway maintenance programs with extra

emphasis on keeping the bike lanes and roadway shoulders clear of debris and keeping vegetation overgrowth from blocking visibility or creeping into the roadway.

The typical maintenance costs and assumptions for 1 mile of bikeway and sidewalk per year are as follows:

Bike Path:	\$10,578	Lighting, where included; removal of trash and vegetation overgrowth, sweeping, graffiti removal.
Bike Lanes:	\$2,000	Repainting lane stripes and stencils, sign replacement as needed
Bike Routes/Sharrows:	\$1,000	Sign and shared use stencil replacement as needed
Sidewalk	\$5,000	Minor repairs of cracks and settlement. Sidewalk maintenance is typically the responsibility of the adjacent property owner, and some public maintenance is often involved. Many of these facilities are adjacent to public land.

Other improvements related to the above basic bicycle and pedestrian facilities will require maintenance:

Retaining walls - New retaining walls will require maintenance of associated drains, graffiti removal, and potentially repair of cracks. An annual allowance of \$1.00 per square foot of new wall is assumed.

Drainage systems – new storm drainage systems will require inspections and maintenance, especially before and after storms to clear debris. An annual allowance of \$1.00 per lineal foot of new drain is assumed.

Maintenance of the Alto Tunnel route will be more expensive than the typical bike path maintenance cost due to special activities and costs associated with maintaining the tunnel. It will require opening and closing of safety barriers, upkeep of lights and fences, and vandalism abatement in addition to the cost of insurance. The current estimated annual operation and maintenance cost for the Cal Park Tunnel multi-use path is \$150,000.² The Cal Park Tunnel, at 1,100 lineal feet is half the length of the Alto Tunnel. The Alto Tunnel operation maintenance cost is assumed to be on the order of 1.5 times the cost of the Cal Park Tunnel.

Based on these requirements and examples, Table 4-3 presents estimated annual maintenance costs for the three project alternatives and various options. These maintenance costs do not include the long-term repair and replacement costs for the facilities, which will be factors of the original construction cost.

² Ed Hulme, Superintendent, County of Marin Parks and Open Space, personal communication.

Table 4-3 – Maintenance Costs Estimates for the Three Project Alternatives

Alternative	Facility Type	Length in Feet	Length in Miles	Cost per Mile	Subtotal Cost
Horse Hill Route	Multi-Use/Bike Paths (see note 1)	2,240	0.4	\$10,578	\$4,488
	Bike Lanes (see note 2)	0	0	\$2,000	\$0
	Bike Routes/Sharrows (see note 3)	8,990	1.7	\$1,000	\$1,703
	Sidewalks/Pedestrian Paths (see note 4)	3,080	0.6	\$5,000	\$2,917
	Unit	Quantity	Unit Cost		
	New Retaining Walls	Square feet	6,600	\$1.00	\$6,600
	New Drainage Systems	Lineal Feet	400	\$1.00	\$400
	Total Cost				\$16,107
	Unit	Quantity	Unit Cost		
"Sunken Path" Option - add:	New Retaining Walls	Square feet	14,000	\$1.00	\$14,000
	New Drainage Systems	Lineal Feet	2,000	\$1.00	\$2,000
	Total Cost (add)				\$16,000
Alternative	Facility Type	Length in Feet	Length in Miles	Cost per Mile	Subtotal Cost
Alto Tunnel Route	Multi-Use/Bike Paths (see note 1)	7,980	1.5	\$10,578	\$15,987
	Alto Tunnel (see note 5)	2,250	0.4	N.A.	\$275,000
	Bike Lanes	0	0	\$2,000	\$0
	Bike Routes/Sharrows	0	0	\$1,000	\$0
	Sidewalks/Pedestrian Paths (see note 4)	14,618	2.8	\$5,000	\$13,843
		Unit	Quantity	Unit Cost	
	New Retaining Walls	Square feet	1,000	\$1.00	\$1,000
	New Drainage Systems	Lineal Feet	2,290	\$1.00	\$2,290
	Total Cost				\$308,120
Alternative	Facility Type	Length in Feet	Length in Miles	Cost per Mile	Subtotal Cost
Camino Alto/ Corte Madera Ave Route	Multi-Use/Bike Paths (see note 1)	0	0	\$10,578	\$0
	Bike Lanes	11,560	2.2	\$2,000	\$4,379
	Bike Routes/Sharrows	1,000	0.2	\$1,000	\$189
	Sidewalks/Pedestrian Paths (see note 4)	1,970	0.4	\$5,000	\$1,866
		Unit	Quantity	Unit Cost	
	New Retaining Walls	Square feet	26,900	\$1.00	\$26,900
	New Drainage Systems	Lineal Feet	0	\$1.00	\$0
	Total Cost				\$33,334
Alternative	Facility Type	Length in Feet	Length in Miles	Cost per Mile	Subtotal Cost
Sidewalk Extension to Overlook Road Option (add)	Sidewalks/Pedestrian Paths (see note 4)	2,760	0.5	\$5,000	\$2,614
		Unit	Quantity	Unit Cost	
	New Retaining Walls	Square feet	4,000	\$1.00	\$4,000
	Total Cost (add)				\$6,614
Alternative	Facility Type	Length in Feet	Length in Miles	Cost per Mile	Subtotal Cost
E. Blithdale Crossing and Connection Improvements	Multi-Use/Bike Paths (bridge or UC)	800	0.2	\$10,578	\$1,603
	Bike Lanes	0	0.0	\$2,000	\$0
	Bike Routes/Sharrows	570	0.1	\$1,000	\$108
	Unit	Quantity	Unit Cost		
(could apply to any of the routes)	New Bridge or UC Structure (same factor as Retaining Walls) - assume 800' x 20'	Square feet	16,000	\$1.00	\$16,000
	Total Cost				\$17,711

5 Implementation

This section outlines typical major steps to implement the alternative route improvement conceptual projects, and potential considerations for priorities and phasing of improvements. No actual project commitments, priorities, or phasing are included in the scope of this Study. This must be resolved separately by the agencies with jurisdiction or interest in the projects. The implementation factors in this section are provided for consideration in future discussion and decision-making processes.

As discussed in the introduction to the Study, the objective is not to pick the best route, but to delineate and estimate the desirable improvements to each of the three routes. It may be desirable and feasible ultimately to improve two routes, or all three routes.

5.1 Project Implementation Steps

The three project alternatives have different implementation steps due to the differences in jurisdictions, conditions, issues, and facility type. This section provides a simplified summary of the steps to implement the projects, and assumes that each project is independent from the others. A basic step common to all the alternatives is the assignment of staff to administer the project and take responsibility for completing each of the steps. This specific assignment of responsibility would need to be resolved in conjunction with future decisions about proceeding with any of the alternatives. “Placeholder” costs for project administration are included in the cost estimates.

The Alto Tunnel alternative has the most complicated process for implementation due to right of way issues, technical complexities, and the number of parties involved. Horse Hill has some complications since it is in Caltrans right-of-way, and Camino Alto/Corte Madera Avenue is the least complicated because it only involves the two cities and is an adopted project in both the Corte Madera Bicycle Transportation Plan and Mill Valley Bicycle and Pedestrian Transportation Plan.

5.2 Potential Project Phasing

Phasing of the work may be desirable to implement portions with the greatest benefit, fewest constraints, simplest process, and/or most feasible funding. There are specific areas of improvement along the routes that could be implemented and provide significant benefits whether or not any of the other routes were improved:

- Improvements on East Blithedale at Lomita Avenue (Segment 11) may be a potential high priority/early phase of implementation. These improvements would be of immediate benefit to bicyclists, pedestrians, and drivers. They would not entail a commitment to any of the 3 routes, but would complement any of the 3 routes.
- The ramp from Ashford to the existing multi-use path (part of Segment 1) and the path bypassing the parking lot at Maguire Elementary School (Part of Segment 2A), along with the extension of sidewalks or a path along Lomita, and bike route making and signage improvements (Segments 2A and 2B) are other projects that would have immediate benefits and not entail any commitment to an alternative.

- Similarly, improvement of the existing pathway and bike route connections north and south of Redwood Avenue (Segments 9B and 10) would benefit existing users regardless of whether other improvements were implemented,
- Improvement of the Sanford Street and Madera Boulevard intersection with Tamalpais Drive (Segments 5 and 6). This intersection is a challenge for bicyclists and pedestrians to negotiate. It is already the subject of improvement concepts identified in the TAM-sponsored *Greenbrae/Twin Cities Corridor Study*.
- Widening of Camino Alto and Corte Madera Avenue for climbing lanes or bike lanes is the next logical project phase because the project is already an adopted plan of all involved agencies, there are no major right-of-way or permit requirements, and the project is relatively straightforward from a technical standpoint, though it is a long route and there are many details of design and implementation that would need to be resolved. Improvement of this route would be beneficial to bicyclists and drivers, because it is popular with many bicyclists for its winding, hilly, and scenic qualities, and bicyclists have stated that they will continue to use regardless of other route improvements.

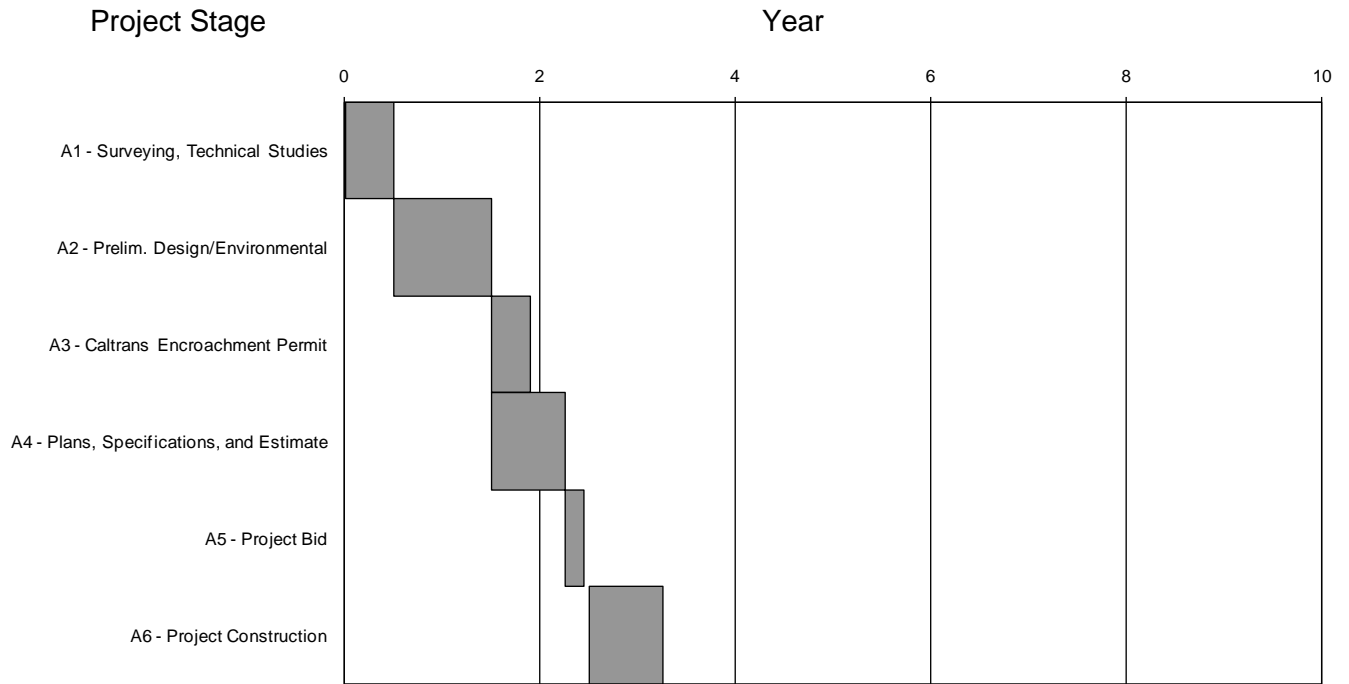
The implementation of any of the above phases as a discrete project would involve the basic steps outlined in the following sample project timelines, probably in a compressed schedule, depending on project requirements and schedule.

5.3 Sample Implementation Timelines

Sample timelines for implementation of the three routes between Mill Valley and Corte Madera were prepared to show typical implementation steps based on the known requirements. These timelines are highly simplified and are likely to vary due to many unpredictable factors that can affect a complex project. They illustrate the relative sequence and duration of tasks rather than a precise schedule. The actual schedule would need to be detailed by the project managers in coordination with partner and funding agencies.

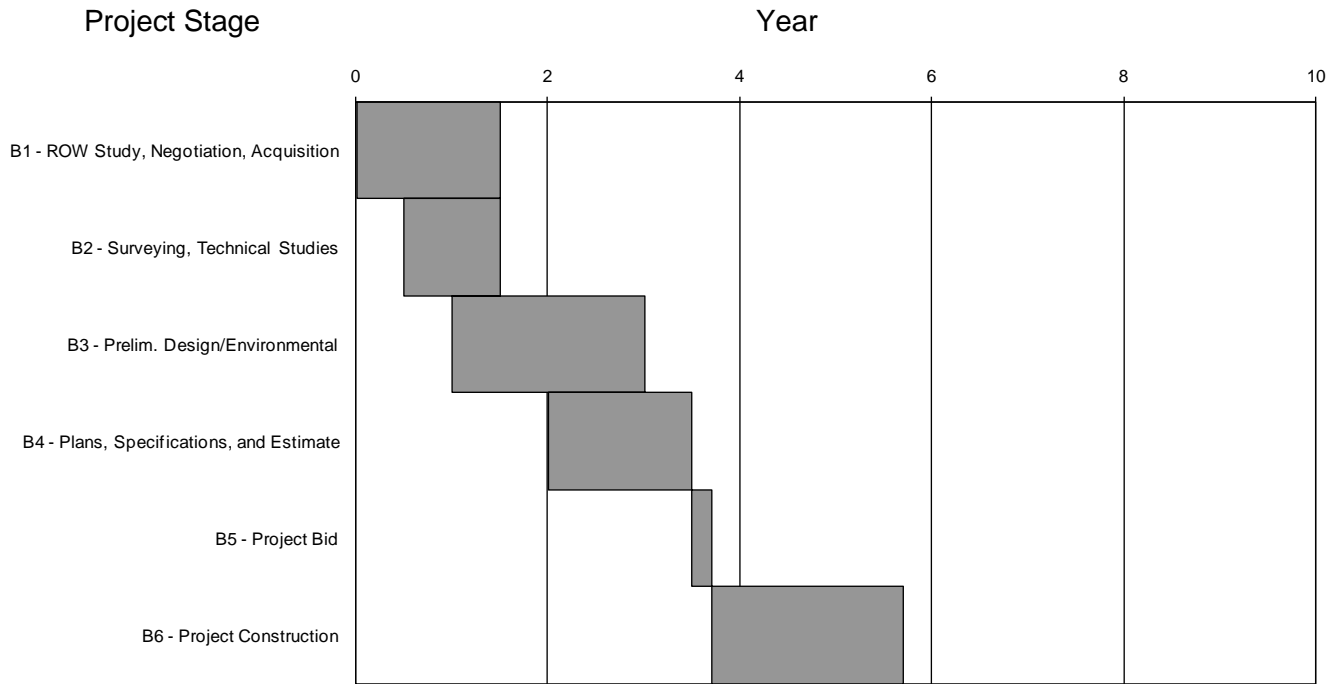
The following three graphs show potential “best case” implementation scenarios for the three projects. Year zero does not represent the present, but is the point at which project commitments and funding are in place, and implementation is actively undertaken.

Figure 5-1: Horse Hill Route Implementation Timeline Example



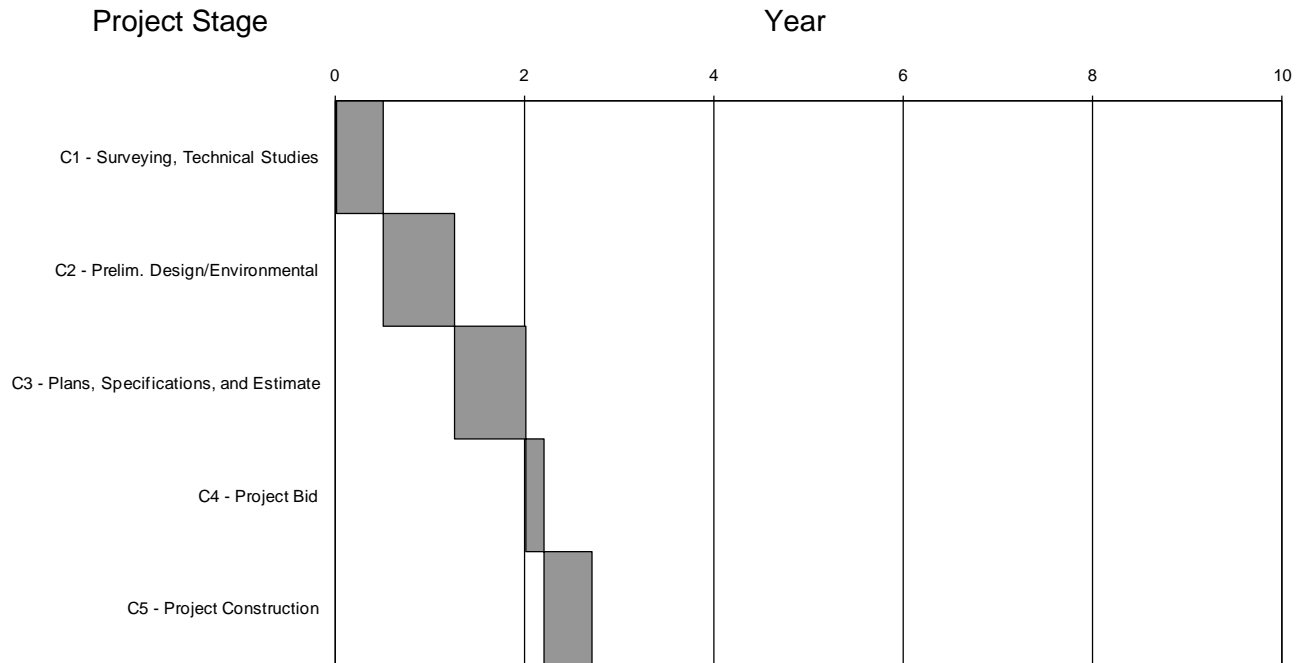
Note: illustrates potential sequence and duration of tasks after project commitment, funding and start-up. Actual schedule would be detailed by the project managers in coordination with partner and funding agencies.

Figure 5-2: Alto Tunnel Route Project Timeline Example



Note: illustrates potential sequence and duration of tasks after project commitment, funding and start-up. Actual schedule would be detailed by the project managers in coordination with partner and funding agencies.

Figure 5-3: Camino Alto/Corte Madera Avenue Route Project Timeline Example



Note: illustrates potential sequence and duration of tasks after project commitment, funding and start-up. Actual schedule would be detailed by the project managers in coordination with partner and funding agencies.

5.4 Funding Sources

Funding for bicycle and pedestrian projects can come from a variety of sources. The funding section in the 2008 *Marin County Unincorporated Area Bicycle and Pedestrian Plan* covers federal, state, regional and local sources of funding, as well as some non-traditional funding sources that have been used by local agencies to fund bicycle and pedestrian infrastructure.