

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**

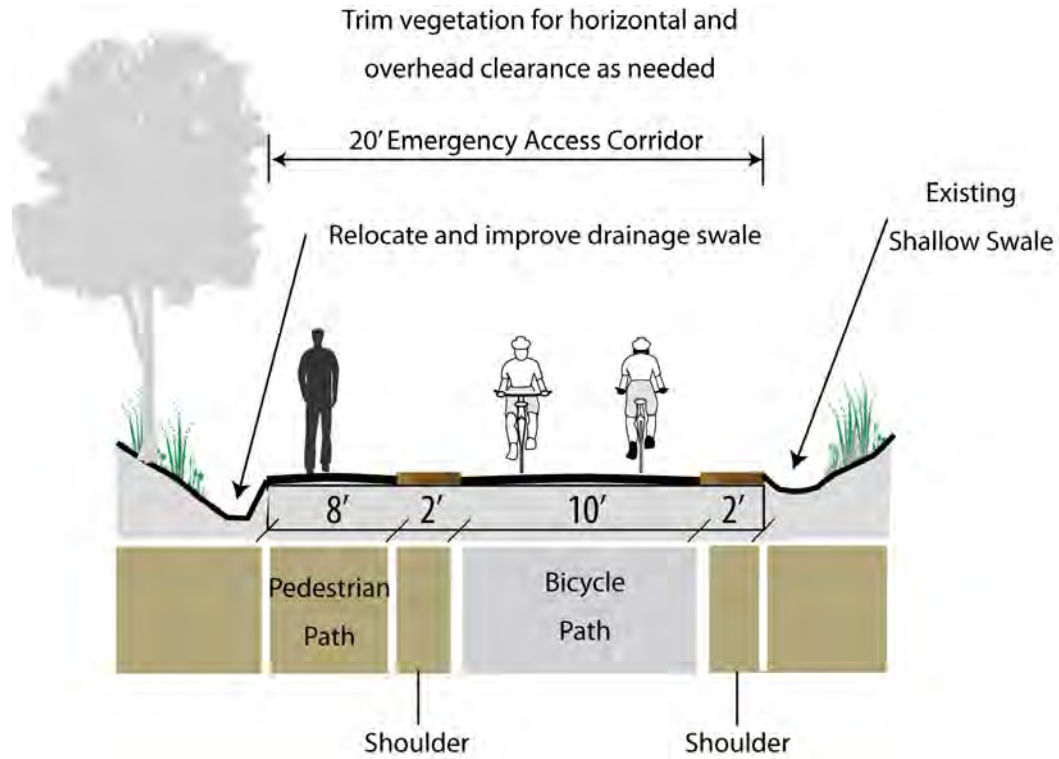


Figure 2-23: Section through Multi-Use Path



Segment 7 Improvement Concepts

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

Segment Location Map

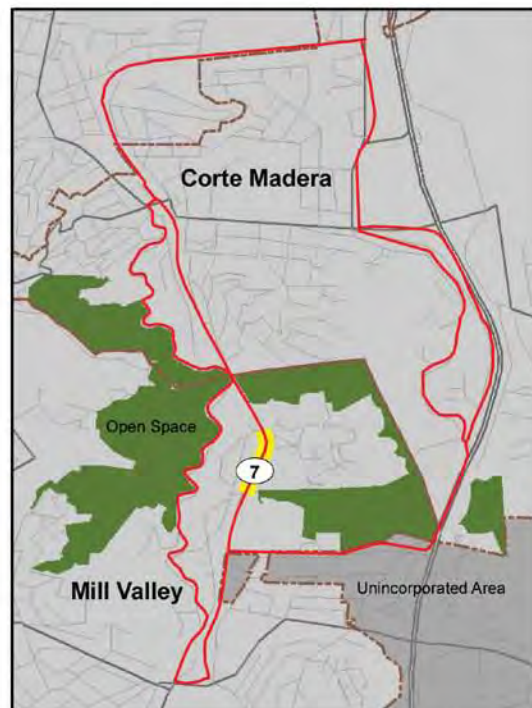




Figure 2-24: South Portal Emergency Vehicle Turnaround Plan

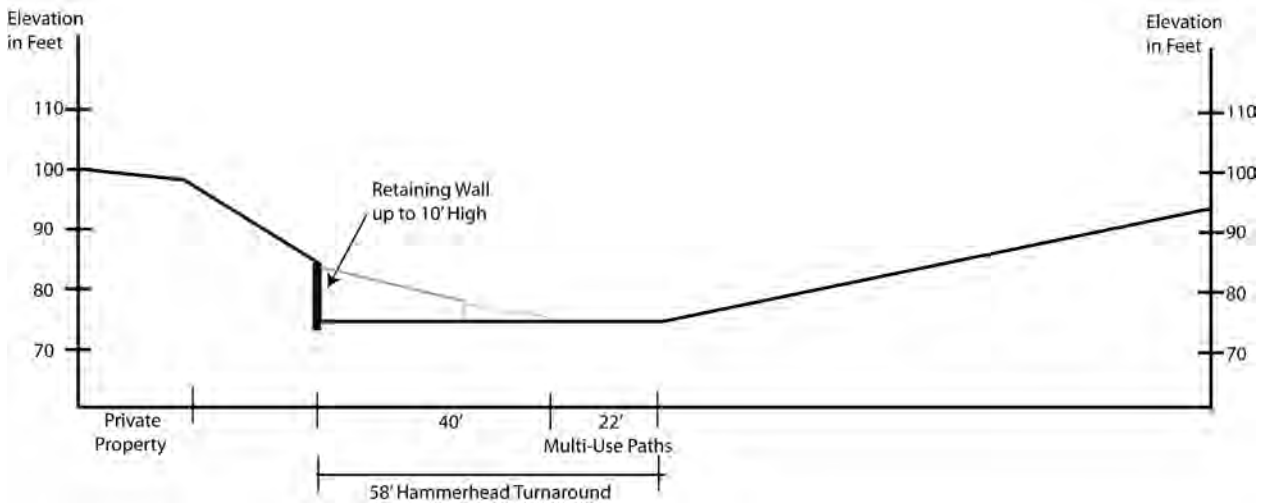


Figure 2-25: South Portal Emergency Vehicle Turnaround Section

*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.

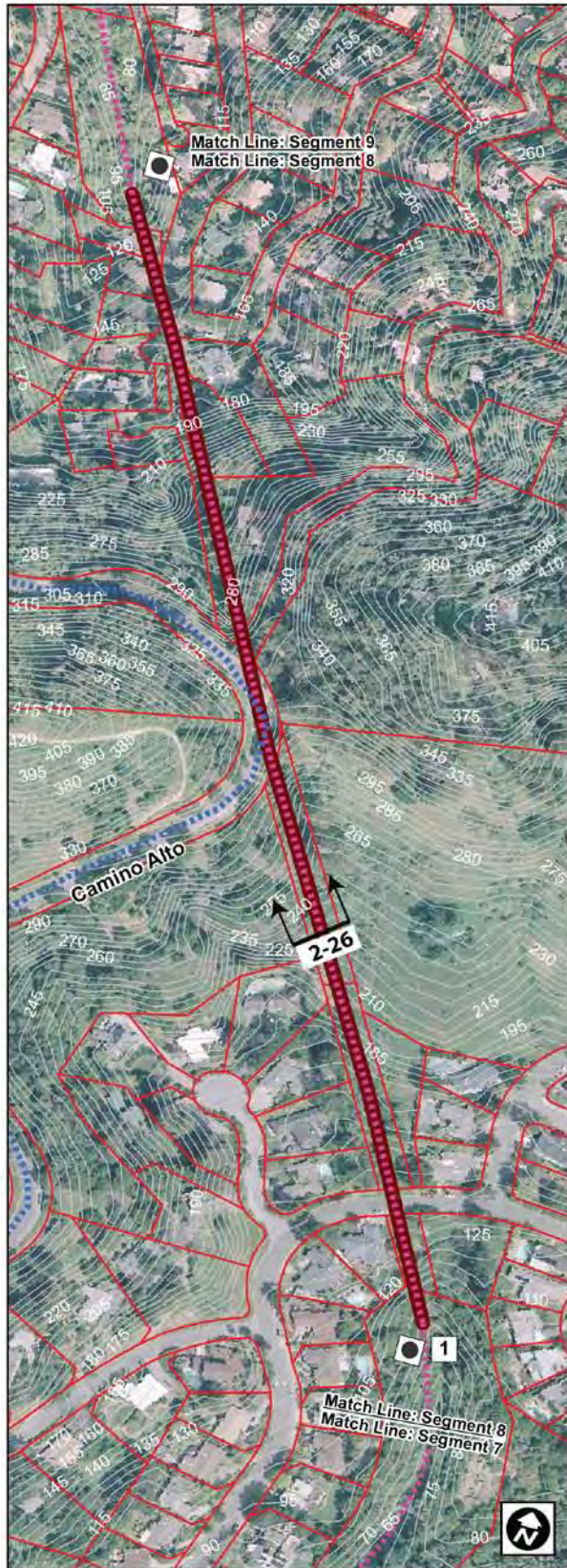
#### Issues: (discussed in detail in Route overview)

- 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**

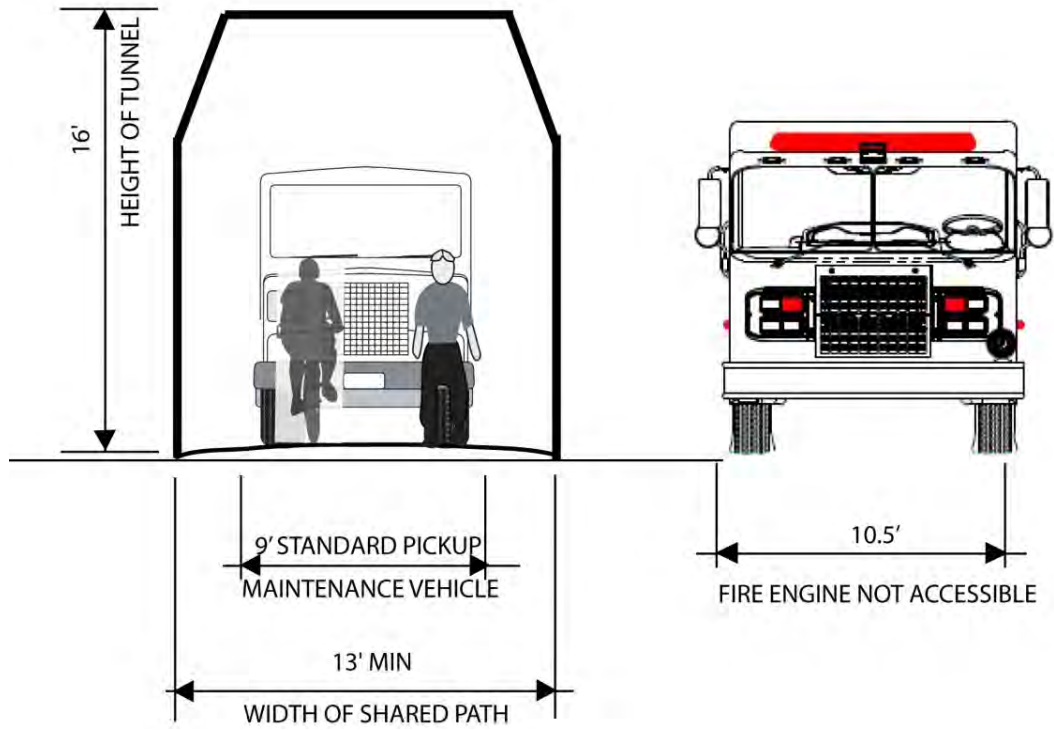


Figure 2-26: Cross-Section through Tunnel



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



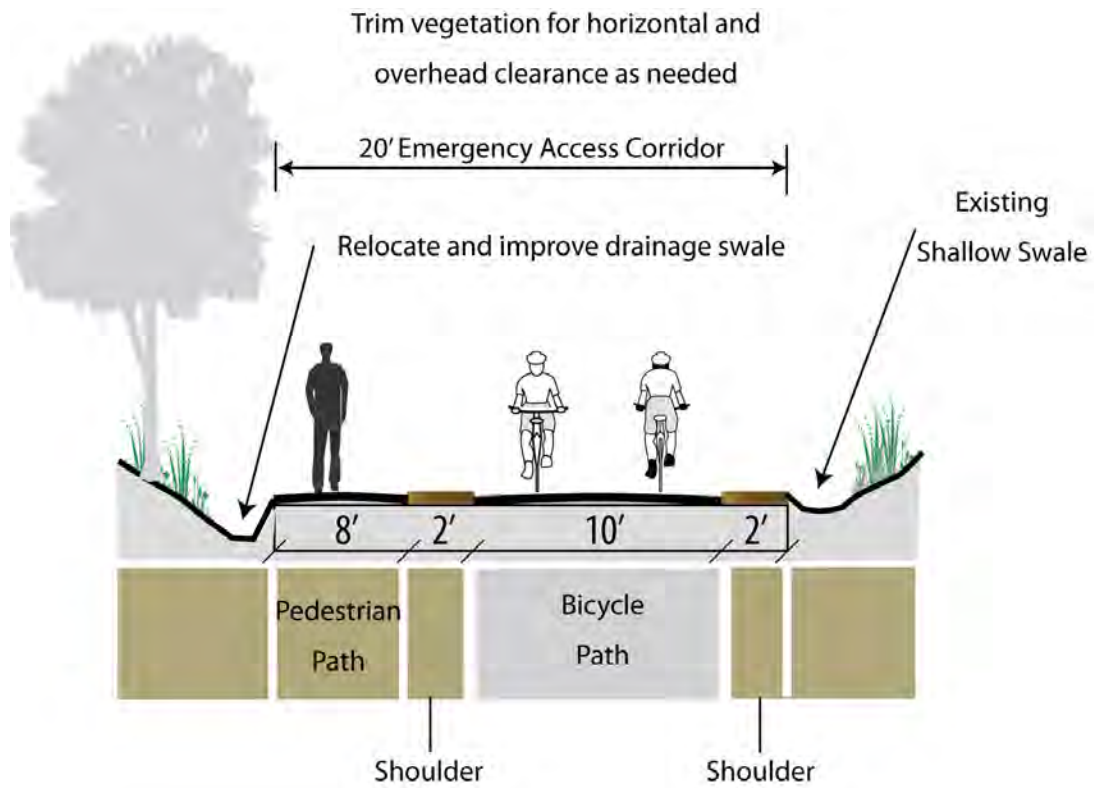


Figure 2-27: Section through Multi-Use Path

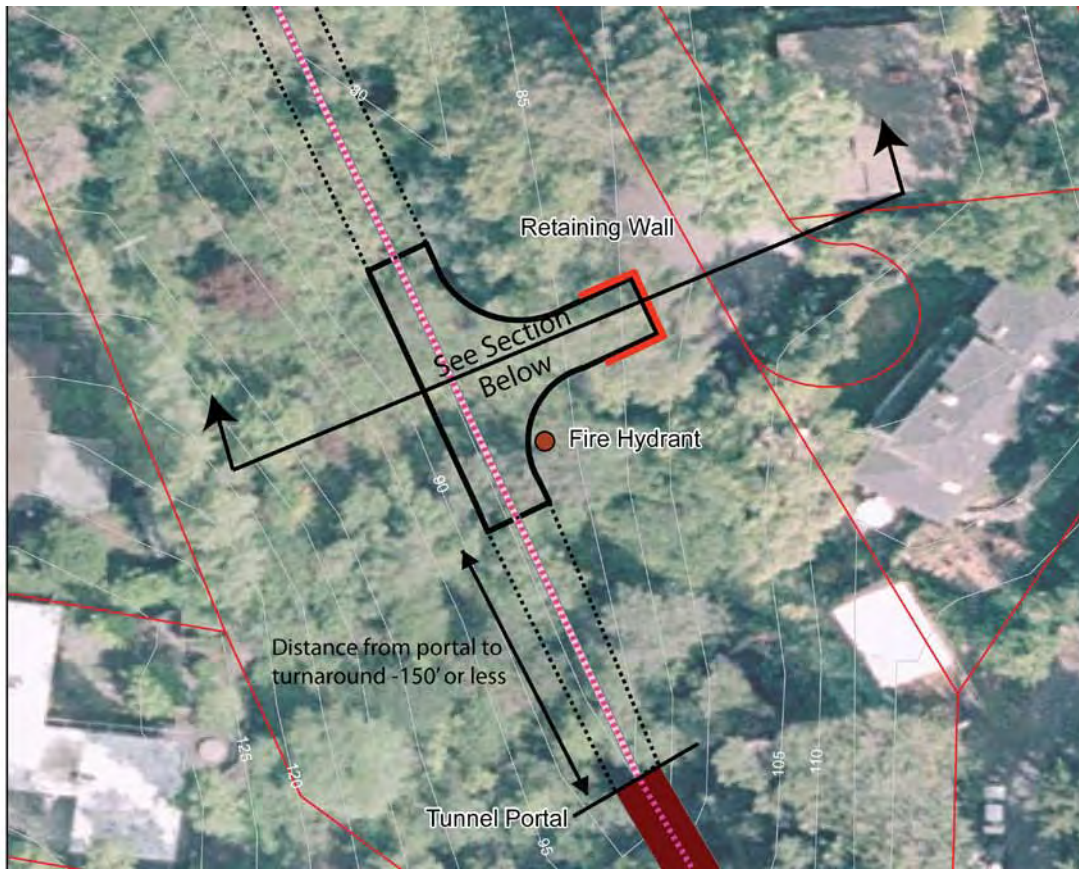


Figure 2-28: North Portal Emergency Vehicle Turnaround Plan

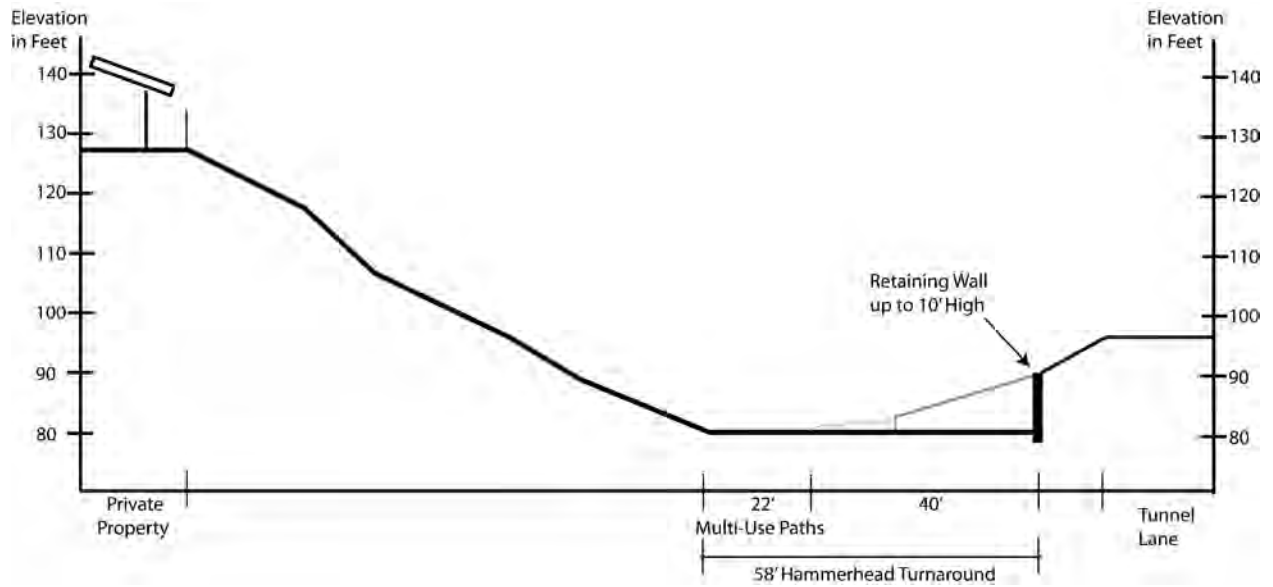


Figure 2-29: North Portal Emergency Vehicle Turnaround Section

## 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)
- Widen existing 8' pathway to 12' multi-use path
- On street bike route alternative

**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 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.



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

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.

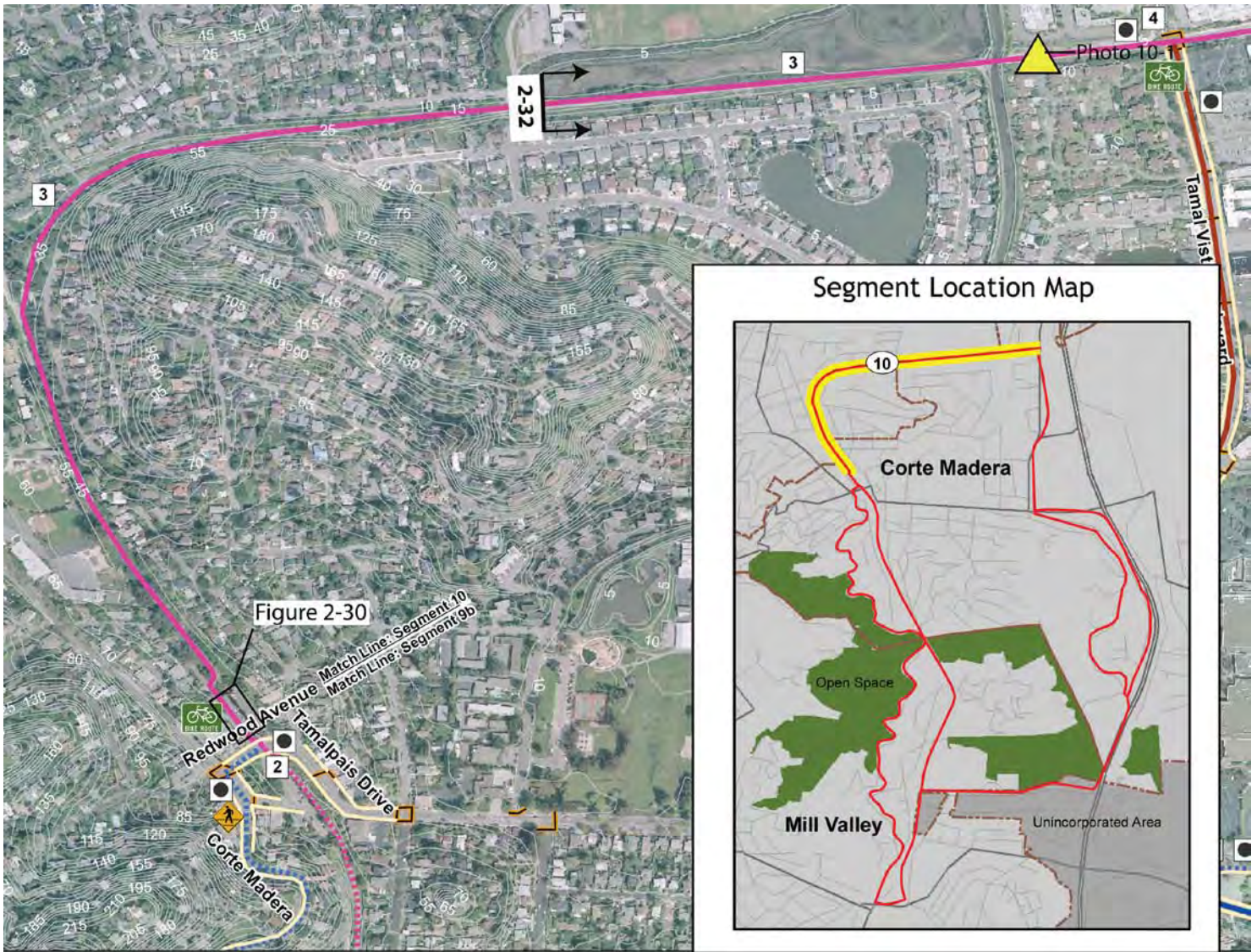
If this alternative is implemented, consider reconfiguring the head-in 90-degree parking on Montecito Drive to back-in angled parking to enable improved sight lines between parking motorists and bicyclists. Back-in angled parking has been utilized in a number of downtown settings to improve visibility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

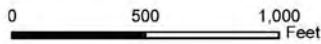


*Photo 10-1: View west from intersection of Sandra Marker Trail and Tamalpais Drive*

Improvement Cost: \$164,000



Segment 10 Improvement Concepts



(see page 2-1 for Master Map Legend)

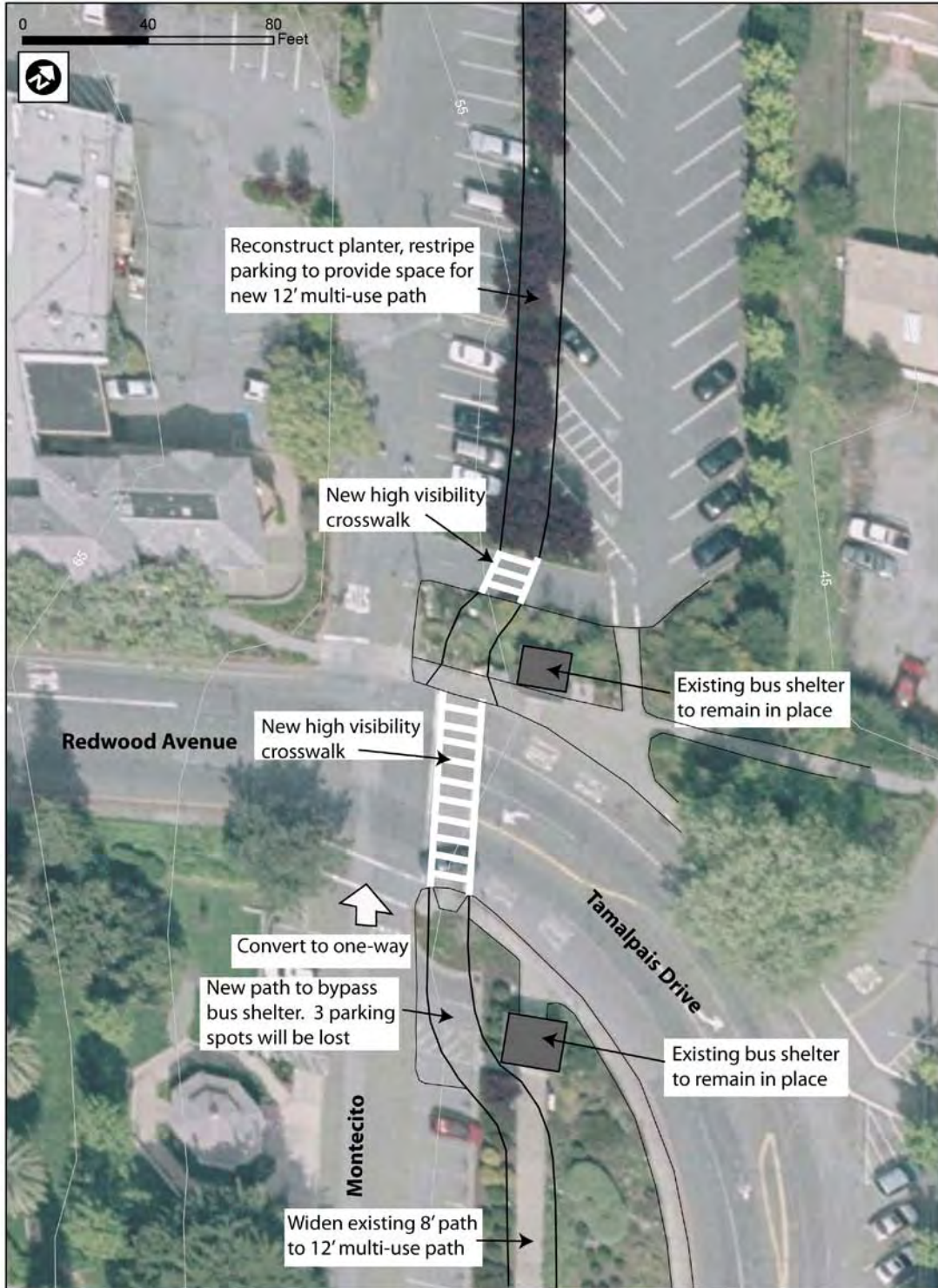


Figure 2-30: Plan View of Improvements near Redwood/Montecito Intersection

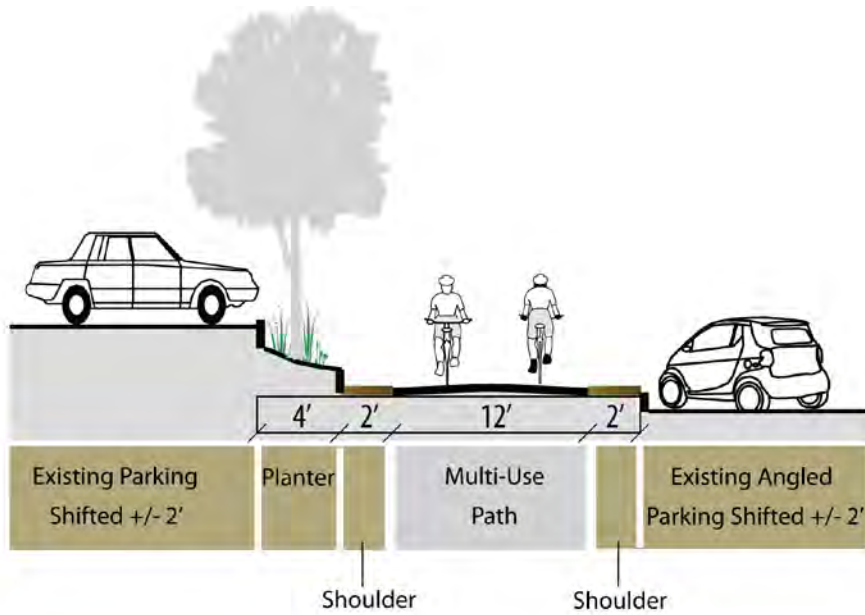


Figure 2-31: Section through Re-Constructed Planter and New Path

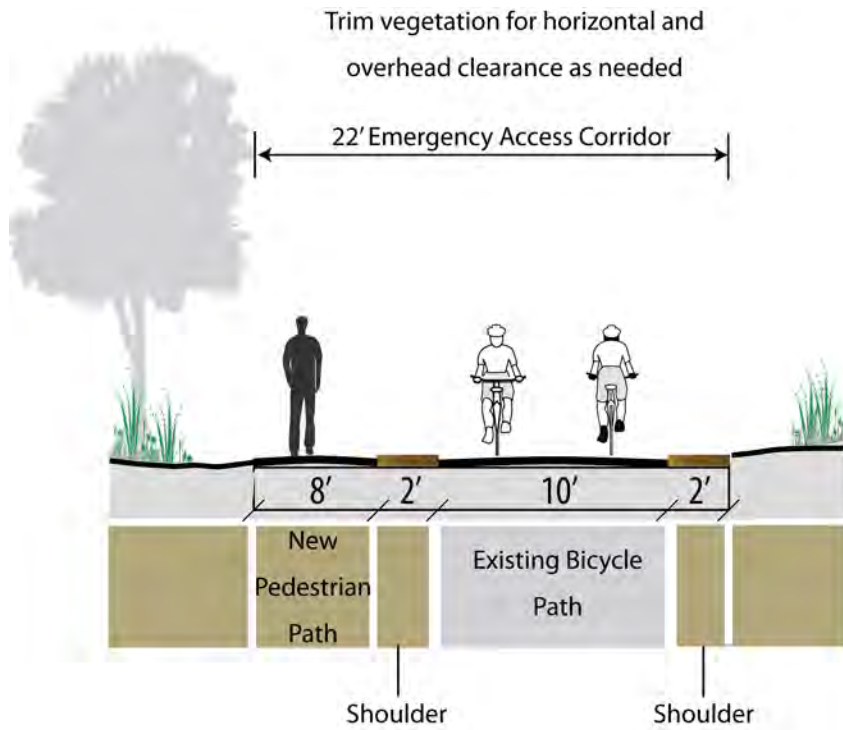


Figure 2-32: Section Through Existing Sandra Marker Path with New Pedestrian Path