

COMMUNITY DESIGN + ARCHITECTURE

Region • City • Neighborhood • Building

Memorandum

June 20, 2002

To: Caltrans for Internal Review

From: Phil Erickson and Thomas Kronemeyer, Community Design + Architecture

Total of 11 pages including attachments

Re: El Camino Real Schematic Design Plan — *Context Sensitive Design Features*

This memo describes the specific design features or “elements” that are being considered as part of the development of the Schematic Design Plan for El Camino Real in Palo Alto; specifically those that may vary from Caltrans’ current standards as defined in the Highway Design Manual and by other current policies of Caltrans. In this memorandum we describe the trade-offs that have been considered in arriving at the proposed designs. The majority of trade-offs are between the design standards for various modes and tree planting standards. As we have illustrated in the “Ideal” street cross section the existing 120 foot right-of-way would need to be widened by 26 feet in order to meet the recommended standards for all of the design elements.

We welcome Caltrans participation in the process of evaluating these trade-offs so that El Camino Real becomes a street that satisfies the community’s goals and results in a safe and efficient design for all modes of transportation.

Identify Exceptions Granted for Similar Design Variations

It would be helpful if Caltrans could identify examples of cases where they have granted the desired flexibility in the standards through their exceptions process, this would allow the Consultant Team to draw parallels between those cases and the conditions that exist along El Camino Real in Palo Alto.

Project Objectives

The variations from existing highway design standards are being requested in order to achieve the projects goals and objectives. The following defines the objectives of the project and the ultimate redesign of El Camino Real. Please note that the objectives are **not** listed in priority order.

Objective 1: Improve Landscape Quality and Quantity

The amount of land area within the r.o.w. for landscaping should be increased, and the number, health, and size of trees and other landscaping should be improved both along the edges of the street and in the median.

Objective 2: Create a Street and Streetscape that Complement Community Character

The design character and function of El Camino Real needs to be more directly related to the existing and desired future character and function of the community along it.

Objective 3: Improve Aesthetic Quality of Street Design

The quality and material of both streetscape elements and the paving of the roadway and sidewalks needs to be improved. The addition of public art and landscape design can also contribute to this objective.

Objective 4: Improve Safety for All Modes

Improvements El Camino Real to be a safer place for all pedestrians (including seniors, school children, and the disabled), bicyclists, transit riders, buses, autos, and trucks.

Objective 5: Provide Equity and Balance for All Modes

The new design of El Camino Real needs to provide for and balance the potential conflicts between all modes of transportation - local and subregional auto, transit, and truck traffic; bicyclists of varied skill levels, and all pedestrians (including seniors, school children, and the disabled).

Objective 6: Design Street to Encourage Motorized Traffic to Drive at the Speed Limit

Traffic needs to be encouraged to drive the speed limit for safety reasons and to allow aesthetic and multimodal improvements to El Camino Real, and this needs to be balanced with traffic and transit needs for mobility along the length of the corridor.

Objective 7: Improve Ability to Cross the Street and at Intersections

Intersections need to be improved, and some mid-block crossings may need to be added, to make the El Camino Real roadway less of a barrier to pedestrians and bicyclists by making it safer and more convenient for them to cross El Camino Real.

Objective 8: Minimize Direct and Indirect Impacts on Quality of Life and the Environment

Efforts should be made in the design, construction, and function of the new El Camino Real to minimize direct and indirect impacts on quality of life along the street and in adjacent neighborhoods and districts. In addition, impacts on the environment should be reduced, particularly as relates to water and air quality and the solar “heat island” effects associated with larger areas of pavement in urban settings.

Objective 9: Create Cost Effective Improvements

The improvements to El Camino Real will be of high quality, to the extent feasible both relative cost to benefit and initial cost compared to life-time cost need to be considered.

Objective 10: Define Some Immediate Improvements

A set of improvements should be identified that can be implemented as soon as possible to build incrementally to the ultimate vision for the future of El Camino Real; particularly in regards to planting trees and making other landscape improvements in the near term.

Context Sensitive Design Features Needing “Standards Variation”

Each design feature is described below as is the linkage to specific project objectives. Please note that the standard variations are generally listed in order of priority.

A. Design Speed & Relationship to Posted Speed

Current Condition/Standard

Design speed is “infinite” given the straight alignment of the majority of the street or generally 40 to 50 mph (5 to 10 mph over the posted speed of 35 to 40 mph). Most of the design features support this higher speed, including: vertical and horizontal alignment, lane widths, clearances, lane transitions and sight lines.

Desired Future Condition

Design the street so that traffic speeds will be reduced to 30 to 35 mph. When designing elements of the street utilize appropriate design speeds, i.e. the design speed should have a relationship to traffic safety as well as the objective of getting traffic to drive at the posted speed limit. [Note: Highway Design Manual defines a range for urban arterial streets with extensive development at 30 to 45 mph, and AASHTO defines a range for urban arterials of 20 to 45 mph].

Related Objectives:

- Objective 4: Improve Safety for All Modes
- Objective 5: Provide Equity and Balance for All Modes
- Objective 6: Design Street to Encourage Motorized Traffic to Drive at the Speed Limit
- Objective 7: Improve Ability to Cross the Street and at Intersections
- Objective 8: Minimize Direct and Indirect Impacts on Quality of Life and the Environment

B. Number of Lanes

Current Condition/Standard

Caltrans has expressed a desire to maintain the current number of through and turn lanes.

Desired Future Condition

To date the proposed design concepts would maintain the number of turn lanes with the exception of removing the majority of “free” right turn “slips”. The alternatives being developed do include reducing the number of through lanes to two in each direction in locations where additional space in the non-motorized vehicle portions of the r.o.w. (i.e.; median, sidewalks, bike lane, etc.) could best serve the multimodal and aesthetic goals of the project while meeting local and regional requirements

for handling increased traffic in the future, and preserving El Camino's role as an arterial in the regional roadway system.

Related Objectives:

- Objective 1: Improve Landscape Quality and Quantity
- Objective 2: Create a Street and Streetscape that Complement Community Character
- Objective 3: Improve Aesthetic Quality of Street Design
- Objective 5: Provide Equity and Balance for All Modes
- Objective 6: Design Street to Encourage Motorized Traffic to Drive at the Speed Limit
- Objective 7: Improve Ability to Cross the Street and at Intersections
- Objective 8: Minimize Direct and Indirect Impacts on Quality of Life and the Environment

C. Lane Width

Current Condition/Standard

Current lane widths are typically 12 foot width for the #1 and #2 lanes, a 21 foot width for the #3 lane/parking/shoulder, and 12 feet for single left turn lanes with an 11 foot width for additional turn lanes.

Caltrans expressed desired minimum lane widths are 11 foot for through lanes, 10 foot for single left turn lanes, and 11 foot for double left turn lanes.

Desired Future Condition

In order to redistribute the limited r.o.w. to serve all modes, the desired lane widths for the redesign of El Camino Real are: 10 foot for the #1 lane (plus 1 foot shy distance), 10 foot – 6 inches #2 lane in a six lane section, 11 foot for the #3 in a six lane section or the #2 in a four lane section, and turn lane widths of 10 feet for single left turn lanes with an 11 foot width for additional turn lanes as long as truck and turning movements are accommodated.

The major trade-off here is the desire to maintain a 5 foot bicycle lane and a 10 foot wide sidewalk where the roadway has a total of 6 traffic lanes and parking on both sides of the street. In locations where the roadway has 4 through lanes of traffic or a 6 lane cross section with no parking or parking on only one side, the #1 lane could be 10 foot – 6 inches (plus a 1 foot shy distance). [Note: AASHTO minimum for urban arterials of 10 feet for through lanes and turn lanes].

An alternative solution would be to design the #3 lane at a 13 foot width for shared traffic and bicycle use. This is not being recommended by the Consultant Team, because it is not an improvement over the situation today and our expectation that a 13 foot wide lane would not encourage drivers to drive their vehicles at the posted speed limit.

Related Objectives:

- Objective 1: Improve Landscape Quality and Quantity
- Objective 2: Create a Street and Streetscape that Complement Community Character

- Objective 3: Improve Aesthetic Quality of Street Design
- Objective 5: Provide Equity and Balance for All Modes
- Objective 6: Design Street to Encourage Motorized Traffic to Drive at the Speed Limit
- Objective 7: Improve Ability to Cross the Street and at Intersections
- Objective 9: Create Cost Effective Improvements
- Objective 10: Define Some Immediate Improvements

D. Shoulders for “Breakdown Lanes”

Current Condition/Standard

Where parking lanes exist they serve as the “breakdown” lane, and where no parking is allowed the #3 lane is typically 20 feet wide providing an 8 foot “breakdown” lane. The only areas without “breakdown” lanes are in areas leading up to and leaving major intersections, such as Embarcadero, Page Mill, and Arastradero where the limited r.o.w. width does not allow for “breakdown” lanes given the total number of lanes for turning and through traffic needed for the intersections.

Desired Future Condition

The proposed street redesign will retain the current situation near major intersections and, at other locations, will provide “breakdown” lanes in the form of parking lanes, or 5 foot wide bike lanes where no parking is present. Bulb-outs may intermittently interrupt the parking/ breakdown lane.

Related Objectives:

- Objective 1: Improve Landscape Quality and Quantity
- Objective 2: Create a Street and Streetscape that Complement Community Character
- Objective 3: Improve Aesthetic Quality of Street Design
- Objective 5: Provide Equity and Balance for All Modes
- Objective 6: Design Street to Encourage Motorized Traffic to Drive at the Speed Limit
- Objective 7: Improve Ability to Cross the Street and at Intersections
- Objective 9: Create Cost Effective Improvements

E. Sight Distance Setback for Trees

Current Condition/Standard

Trees in medians shall be kept back at least 50 feet (some interpretation that requirement is 100 feet) from the end of medians in order to maintain a safe sight distance. Trees shall not lower sight distance below required standards of the Highway Design Manual for “decision” sight distance. Trees shall be so located that the motorists’ clear vision of any highway signs or signals will be assured at all times.

Desired Future Condition

Left turns at all signalized intersections are “protected” (safe turns directed by traffic signals with green left-turn arrow), so trees within medians will be planted approximately 50 feet from the end of the median. Trees will be planted and maintained so as not to lower sight distance below required standards of the Highway Design Manual (based upon the 30 or 35mph design speed based upon AASHTO standards or the Highway Design Manual’s Table 201.1). One exception to this condition would be at unsignalized intersections for left hand turns from the minor street where the standard sight clearance would result in the elimination of approximately 5 trees which could otherwise be planted in the median, a setback from the median nose of approximately 180 feet. There are many examples of urban arterial state highways where this exception exists. For example, on San Pablo Avenue in Berkeley (SR 123) generally has trees planted within _ feet of the median nose and International Boulevard in Oakland (SR 185) has some trees planted 12 feet back from the nose.

Trees shall be so located and maintained that the motorists’ clear vision of any highway signs or signals will be assured at all times.

Related Objectives:

- Objective 1: Improve Landscape Quality and Quantity
- Objective 3: Improve Aesthetic Quality of Street Design
- Objective 6: Design Street to Encourage Motorized Traffic to Drive at the Speed Limit
- Objective 8: Minimize Direct and Indirect Impacts on Quality of Life and the Environment
- Objective 9: Create Cost Effective Improvements
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F. Mid-block Pedestrian Crossings

Current Condition/Standard

Along several segments of El Camino, including the section along Palo Alto High School, there are no pedestrian crossings for distances of 2,000 feet or more, forcing pedestrians to walk long distances out of their way to safe crossing points or to cross at undesignated, unprotected locations. Caltrans expressed opposition to adding un-signalized mid-block crosswalks, but indicated that pedestrian signals could be considered at appropriate locations.

Desired Future Condition

Install signal-protected pedestrian crosswalks, where signals meet standard “warrants”, along routes between major pedestrian activity generators, such as Paly (Palo Alto High School), Stanford, Caltrain, and Research Park. To justify signals, consider full array of potential warrants including: existing and projected pedestrian volumes, school routes, and system warrants. Consider additional crosswalks at unsignalized locations only where justified by FHWA guidelines and deemed potentially acceptable to Caltrans based on site-specific criteria. Place crossings at locations where motorists are most likely to expect them, such as intersections. To improve visibility and reinforce design speeds include high-visibility striping and/or paving materials for crosswalks, warning signs, pedestrian activated and coordinated signals or flashing beacons or in-pavement flashing lights, and bulb-outs to

improve visibility and shorten pedestrian crossing distance. [Note: we would appreciate guidance from Caltrans as to the preferred method of providing signal protection].

Other measures will be studied and considered on a case-by-case basis, subject to Caltrans approval, including “speed tables” and “pedestrian corrals” in the median. “Speed tables” would be used to create raised crosswalks at some intersection and mid-block crossings with the goal of highlighting these locations to improve pedestrian safety and to complement the goal of getting drivers to drive at the posted speed limit. [Note: the Danish Road Directorate has a standard for a speed hump application on a 50 kph (31mph) arterial resulting in a length of 31 feet. A typical US speed table has a total length of 22 feet (two 6 foot ramps plus a 10 foot “top”). Heights of speed tables range from 2.5 to 6 inches. Further review of European and US designs would be needed to determine the appropriate height and length of a speed table for El Camino Real]. An alternative would be to provide a slightly raised crosswalk (1/2 inch above asphalt) with the main paving material being concrete pavers or other special paving and poured in place concrete paving as side bands with beveled edges providing a transition to asphalt paving. The goal is to provide a noticeable change in paving surface (a “thump”) that highlights the crossing for motorists.

Pedestrian corrals” would move pedestrians to the safest, most visible locations and orient pedestrians in the direction of opposing traffic prior to crossing the second set of traffic lanes. They can also reduce the main street traffic flow disruption by providing, instead of one long pedestrian “walk” phase, two coordinated shorter crossing phases.) In several locations pedestrian crossings are being considered where the median extends through a “T” intersection, in these cases one-half of the pedestrian crossing is related to the right-in/right-out intersection while the pedestrian crossing on the other side of the median would be considered to be a “mid-block” crossing.

Related Objectives:

- Objective 2: Create a Street and Streetscape that Complement Community Character
- Objective 4: Improve Safety for All Modes
- Objective 5: Provide Equity and Balance for All Modes
- Objective 6: Design Street to Encourage Motorized Traffic to Drive at the Speed Limit
- Objective 7: Improve Ability to Cross the Street and at Intersections
- Objective 8: Minimize Direct and Indirect Impacts on Quality of Life and the Environment
- Objective 9: Create Cost Effective Improvements

G. Trees in Medians

See E. Sight Distance Setback for Trees for discussion of the distance from nose of median to tree.

Current Condition/Standard

6 foot clear distance from face of curb to tree, 13 foot wide median face of curb to face of curb (for segments where speeds are 35 mph or less).

Desired Future Condition

Designs will accommodate a tree larger than 4 inch caliper at breast height in a 12 foot wide median with no turn lane with one exception being the 6 lane cross section with parking and 5 foot bike

lanes on both sides in which case the center median would be 11 feet. For narrow medians at left turn pockets, there are some constrained locations where a 6 foot wide median may be necessary. But in most cases an 8 foot wide narrow median can be achieved [Note: 8 foot wide medians with large trees are a standard for Metro Portland, Oregon, see *Livable Streets*]. The trade-offs that related to median width are: traffic lane widths, bicycle lane widths, and extent of on street parking.

Examples of large trees planted in medians with less than 12 foot width include the following:

- International Blvd. At 99th Street in Oakland (in Caltrans r.o.w.): 4'-2" median next to turn pocket with the first tree 25' from the nose of the median (older planting), one block south there is a recent planting in a 4'-10" median with the first tree 12' from the nose of the median (4 lane cross section with speed limit ranges from 30 to 35 mph);
- Mecartney Road in Alameda: 10' wide median with double row of trees (2 lane cross section with 4'-8" clear of curb) (speed limit at 25 mph);
- El Camino Real at Sylvan in Mountain View (in Caltrans r.o.w.): 11'-6" median (6 lane cross section with speed limit at 35 mph);
- Broadway at 41st Street and most of the length from West Grand to Pleasant Valley Rd. in Oakland: 3'-10" median (6 lane cross section with speed limit at 25 mph but general traffic flow at least 30 mph); and,
- Dublin Blvd. At Hacienda in City of Dublin: 4'-2" median next to turn pocket (6 lane cross section with speed limit at 35 mph).

The following examples are also of interest, although the character of traffic volumes and design speeds vary from the desired future for El Camino Real in Palo Alto:

- Broadway at 25th Street in Oakland: 6'-2" median (4 lane cross section with speed limit at 25 mph);
- Broadway at 23rd Street and along most of the "auto row" area in Oakland: 8' median (4 lane cross section with speed limit at 25 mph); and,
- Mt. Diablo Blvd. At Main Street in Walnut Creek: 6'-2" median (4 lane cross section with speed limit at 25 mph).

Related Objectives:

Objective 1: Improve Landscape Quality and Quantity

Objective 3: Improve Aesthetic Quality of Street Design

Objective 8: Minimize Direct and Indirect Impacts on Quality of Life and the Environment

H. Lane Transitioning Formula

Current Condition/Standard

Two thirds width of transition times design speed (2/3WV). For example, a 2 foot lane shift at a 30 mph speed would require a length of 40 feet for the transition.

Desired Future Condition

Per Manual of Uniform Traffic Control Devices (MUTCD) standard, width of transition times design speed squared divided by 60 ($WV^2/60$). For example, a 2 foot lane shift at a 30 mph speed would require a length of 30 feet for the transition. The use of this formula is desired to reinforce the concept that lane transitions will encourage drivers to travel at the speed limit along El Camino Real.

Related Objectives:

- Objective 1: Improve Landscape Quality and Quantity
- Objective 3: Improve Aesthetic Quality of Street Design
- Objective 6: Design Street to Encourage Motorized Traffic to Drive at the Speed Limit
- Objective 7: Improve Ability to Cross the Street and at Intersections
- Objective 9: Create Cost Effective Improvements

I. Minimum Clearance from Edge of Travel Way to Curb Extensions

Current Condition/Standard

4 foot minimum width from edge of travel way to face of curb extensions.

Desired Future Condition

Where the proposed street sections include a bike lane this distance will be a minimum of 4 feet. In those cases where a bike lane is not present this distance will be 1 foot. Ends of extensions will be reflectorized for visibility under all lighting and weather conditions.

Related Objectives:

- Objective 1: Improve Landscape Quality and Quantity
- Objective 3: Improve Aesthetic Quality of Street Design
- Objective 5: Provide Equity and Balance for All Modes
- Objective 6: Design Street to Encourage Motorized Traffic to Drive at the Speed Limit
- Objective 7: Improve Ability to Cross the Street and at Intersections

J. Bicycle Lane Width

Current Condition/Standard

4 foot minimum width and where parking is present a combined 12 foot total width for bicycle lane and parking lane (e.g. 5 foot bicycle lane and 7 foot parking lane).

Desired Future Condition

In most locations a 5 foot wide bicycle lane is achievable. In most cases a 12 foot minimum combined width for parking and bicycle lanes would be provided with the exception of some sections where parking is required on both sides of 6-lane street; in these cases a 4 foot bicycle lane with a 7 foot parking lane would be provided with the combined width of traffic lane and bicycle lane being 15 feet. [Note: AASHTO 5 foot with curb and gutter or parking lane].

Context Sensitive Design Features Not Needing “Standards Variation”

The following list includes design features which have been raised as potential areas of concern by Caltrans for which the Consultant Team believes no “standard variation” will be needed.

K. Curb Return Radii

Current Condition/Standard

Minimum radii is controlled by bus/truck turn templates.

Desired Future Condition

Curb return radii will be designed to accommodate appropriate vehicle turn templates; minimum standard of 40 foot single-unit truck. Bus and semi-truck templates will be used for curb returns where bus or truck routes are present on streets that intersect with El Camino Real and for streets that are expected to have higher volumes of truck traffic given existing use or zoning/potential future use. The Consultant Team is currently working with Palo Alto staff to identify these locations. In some cases corners could be designed with mountable curbs and streetscape and utility elements would be kept clear of the area required for periodic trucks or emergency vehicles to navigate a turn.

L. Angled Parking Buffer Between Parking and Travel Lane

Current Condition/Standard

Provide “buffer” between diagonal parking and travel lanes.

Desired Future Condition

No angled parking is planned at this time; could be an option where parallel “local access lanes” are used at the option of adjacent development.

M. Shoulder Widths

Current Condition/Standard

Left Shoulder: 1 foot minimum width with 2 foot preferred.

Right Shoulder: 4 foot minimum width without curbs, 5 foot minimum with curbs, and 8 foot with parking. [Note: AASHTO 1 foot minimum width with 2 foot preferred].

Desired Future Condition

Left Shoulder: 1 foot.

Right Shoulder: 5 foot minimum (bike lane width) where no parking is present, and 8 foot minimum where parking is present.