CHAPTER 2 AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND AVOIDANCE, MINIMIZATION AND/OR MITIGATION MEASURES

The following sections are summarized from the technical reports referenced in Appendix F. Persons interested in more complete discussions of technical issues can review these reports at the Department's Public Information Center located at 111 Grand Avenue in Oakland.

As part of the scoping and environmental analysis conducted for the project, the Department considered the following environmental resources. No potential for adverse impacts to these resources was identified with Alternatives 2N and 3N. Consequently, there is no further discussion regarding these resources in this document:

- The Caldecott Improvement Project will not affect farmlands;
- The Caldecott Improvement Project will not affect timberlands; and
- No residential or non-residential units will be required to relocate as a result of this project.

2.1 Human Environment

2.1.1 Land Use

The information presented in this section is taken from the technical report, *Final Community Impact Assessment for the Caldecott Improvement Project* (Parsons, 2005).

2.1.1.1 EXISTING AND FUTURE LAND USE

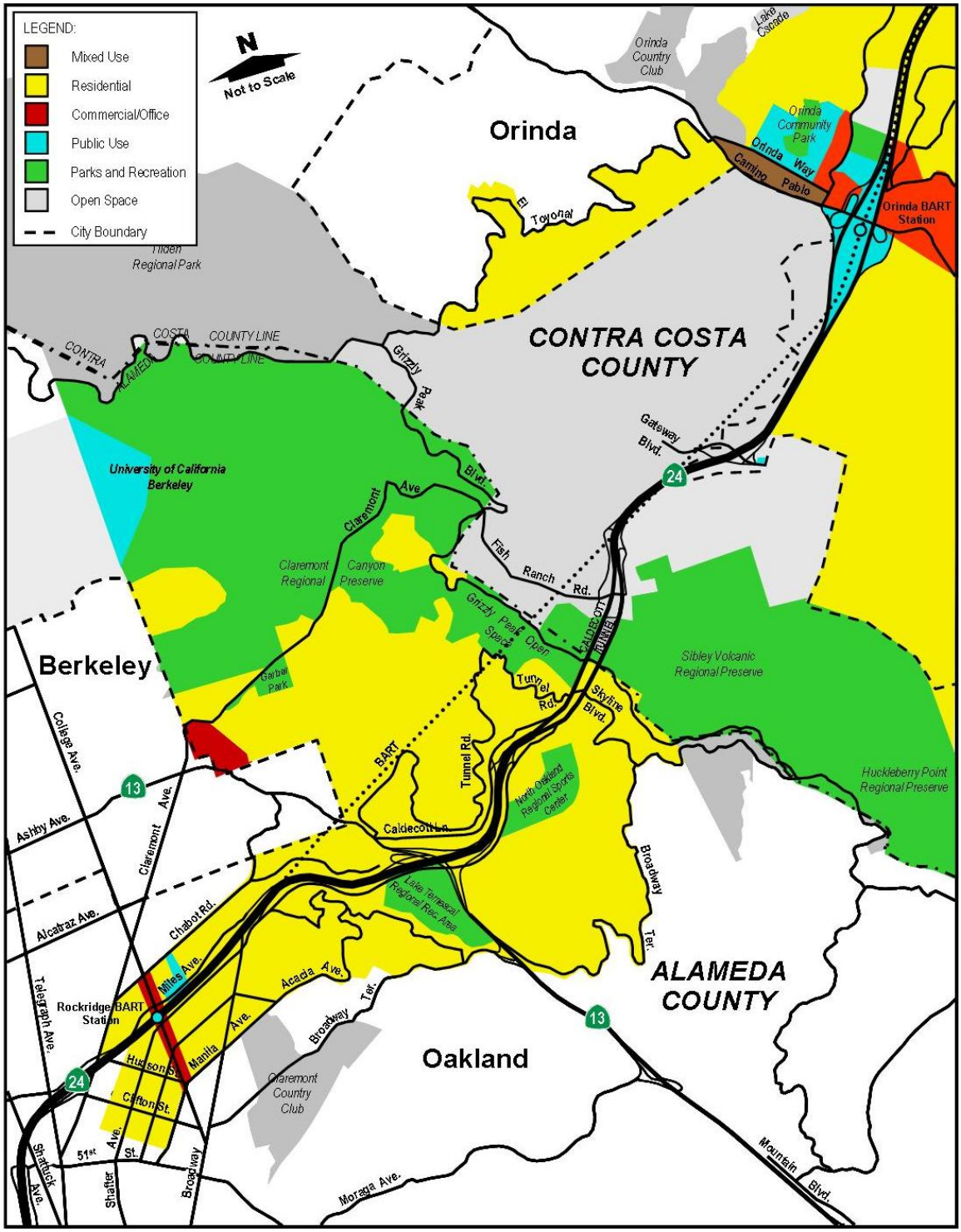
This section describes the existing and future regional land use in the immediate project area and the surrounding vicinity. Two study areas were defined to describe the affected environment: the project study area and the Berkeley study area. Concerns raised during the scoping process were considered when developing the study area boundaries. The project study area includes the immediate project area and vicinity that would be directly affected by the proposed project. The Berkeley study area includes the southern portion of the City of Berkeley that would be indirectly affected by the proposed project as a result of small changes in traffic. The project study area includes portions of Alameda County, Contra Costa County, the City of Oakland and the City of Orinda. The Berkeley study area is located in the City of Berkeley, south of Dwight Way.

Affected Environment

Existing land uses in the vicinity of the Caldecott Improvement Project along State Route 24 are primarily single-family residential in the City of Oakland and rural in the City of Orinda, with some transportation, commercial and institutional uses in both cities. These land uses are described from west to east below and shown in Figures 2.1.1-1 and 2.1.1-2.

In the western segment of the project study area, from Claremont Avenue to the State Route 24 /Broadway Interchange, land uses are predominantly single-family residential.

Figure 2.1.1-1 Existing Land Use in the Project Study Area



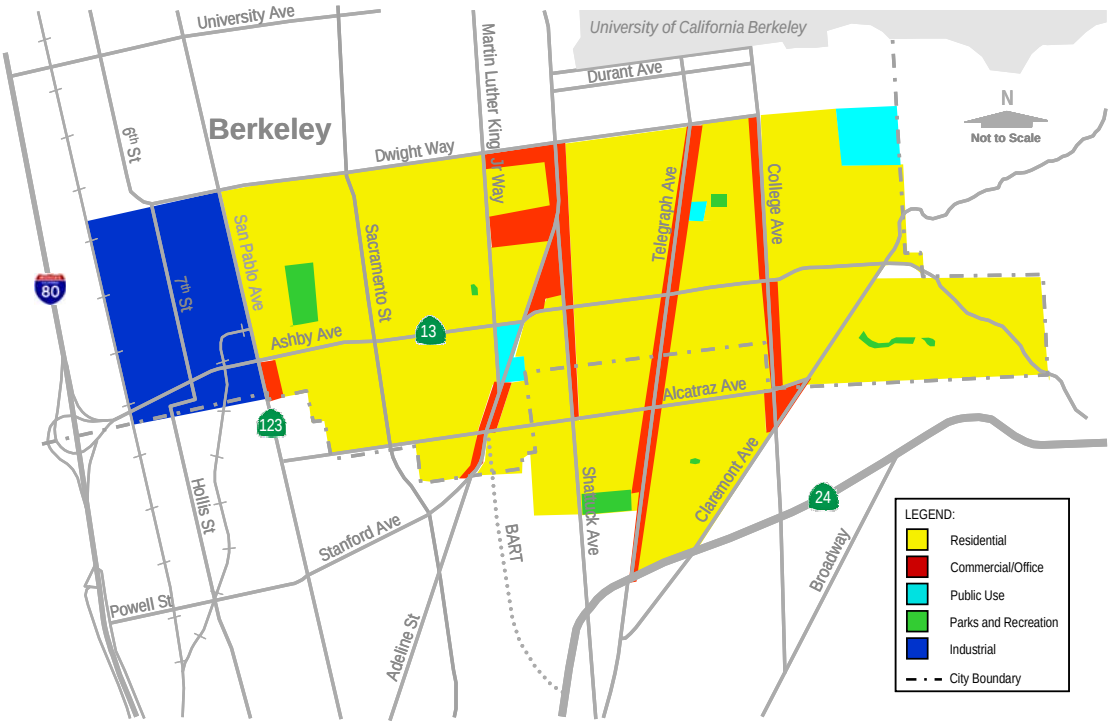
Bay Area Rapid Transit (BART) tracks are in the median of State Route 24 with the Rockridge BART Station located at College Avenue.

From the State Route 24/Broadway Interchange to the State Route 24/State Route 13 Interchange, land uses are single-family residential and recreational. The Lake Temescal Recreation Area is located southwest of the State Route 24/State Route 13 Interchange.

Land uses from the State Route 24/State Route 13 Interchange to the Caldecott Tunnel are predominantly single-family residential on the northside of the highway. Recreational and residential uses are located south of State Route 24. The Caldecott Tunnel extends beneath the Sibley Volcanic Regional Preserve and the Grizzly Peak Open Space.

Residential land uses dominate the area between the Caldecott Tunnel and the State Route 24/Camino Pablo–Moraga Way Interchange. Transportation uses in the area include a Caltrans Park-and-Ride Lot south of the State Route 24/Gateway Boulevard Interchange and the Orinda BART Station and tracks in the median of the highway at Camino Pablo–Moraga Way. Single-family residential land uses are located southwest of State Route 24 near Moraga Way.

Figure 2.1.1-2 Existing Land Use in the Berkeley Study Area



In the Berkeley study area, land uses are primarily residential. Commercial uses line the major north-south corridors between College and Shattuck Avenues. The highest concentrations of commercial uses are located north of Ashby Avenue between Shattuck Avenue and Martin Luther King Jr. Way. Between Interstate 80 and San Pablo Avenue, land uses are predominantly industrial. The Ashby BART Station and the Alta Bates Medical Center are located along Ashby Avenue in the City of Berkeley.

Developable Land and Development Trends. This section describes developable land areas and development trends in the immediate project area and the associated cities, counties, and region as a baseline for assessing the growth potential of the affected area.

Based on the Association of Bay Area Government's (ABAG) Projections 2005, between 2000 and 2030, Alameda County is expected to gain an additional 154,034 households and Contra Costa County an additional 112,991 households. During the same period, the City of Oakland is projected to gain an additional 44,900 households and the City of Orinda an additional 734 households.

The *City of Oakland General Plan*, adopted March 1998, anticipated increases of 600 housing units per year through 2015, as compared to annual increases of 400 units between 1980 and 1995, an increase of nearly 0.5 percent. Most of these new housing units would be located along the city's major transportation corridors, in Downtown, in Transit-Oriented Districts near BART stations, along the Waterfront, or as part of infill projects.

The *City of Orinda General Plan*, adopted in May 1987, projected a total residential development capacity of approximately 7,429 housing units at full build-out (expected to occur in 2005), up from 6,001 in 1980 and 6,468 in 1990. Over the same period, the population was anticipated rise to 18,127 residents, up from 16,825 in 1980 and 17,751 in 1990. This reflects a very slow annual growth rate (about 0.5 percent) compared to that of the majority of Bay Area cities. Population was projected to be 2.44 persons per household in 2005.

According to its General Plan, the City of Berkeley, in addition to having a well-established land use pattern, has experienced no growth in population or housing supply in the last 30 years. From 1970 to 2000, the citywide population has declined from 116,532 to approximately 102,743, and the number of housing units increased from 46,160 to 46,875. Current planning policies encourage infill development because with little vacant land available for development, all new development in Berkeley will be infill development.

Major Approved and Active Projects. There are six major approved and active projects in the project and Berkeley study areas, as shown in Table 2.1.1-1.

Table 2.1.1-1 Major Approved and Active Projects in the Project and Berkeley Study Areas

Project Name	Jurisdiction	Proposed Uses	Project Status
Wilder Housing Development	City of Orinda	Residential/Recreational	Grading starting 2006 and home construction starting 2008
Pine Grove Neighborhood	City of Orinda	Residential/Recreational on 5.75 hectares (14.2 acres)	Construction date to be determined
Southwood Valley Subdivision	City of Orinda	Residential	Beginning EIR Process
West Berkeley Bowl	City of Berkeley	Commercial on 0.47 hectares (1.16 acres)	Completed Design Review
Jubilee Village	City of Berkeley	Mixed-use on 0.21 hectares (0.52 acres)	Completed Design Review
2701 Shattuck Avenue	City of Berkeley	Mixed-use on 0.11 hectares (0.27 acres)	Completed Design Review
Source: City of Orinda Planning Department, February 2005 City of Berkeley Planning Department, April 2005			

Impacts

Implementation of the No-Build Alternative would have no long-term effect on land uses in the project area, and location and characteristics of transportation facilities and uses would not change.

Under the Build Alternatives, land use changes would be associated with the acquisition of property for modifications to existing transportation facilities and construction of new facilities. A comparison of land use changes is provided in Table 2.1.1-2.

Table 2.1.1-2 Estimated Land Use Changes Anticipated

Option	Total Vacant or Other Land Converted to Transportation	
	hectares (ha)	acres (ac)
Alternative 2N	6.07	15.00
Alternative 3N	7.83	19.35
Source: Parsons 2005		

Avoidance, Minimization and/or Mitigation Measures

As noted above, no adverse impacts are anticipated; therefore, no minimization or mitigation measures are recommended.

2.1.1.2 CONSISTENCY WITH STATE, REGIONAL, AND LOCAL PLANS

Planning goals and policies to direct the physical development of the cities and counties affected by the Caldecott Improvement Project are described below.

Affected Environment

Alameda County General Plan. The Alameda County General Plan includes planning goals, objectives, policies, and programs for the County's 14 cities and six unincorporated sub areas. Since the cities retain the authority and primary responsibility for planning matters within their corporate boundaries, the focus of the General Plan is on the unincorporated area of the county. Planning goals and policies that are relevant to the Caldecott Improvement Project are described in the individual general plans for the cities of Berkeley, Oakland, and Orinda.

Contra Costa County General Plan. Contra Costa County land use planning goals and policies are guided by the *Contra Costa County General Plan, 1995-2010*, adopted in July 1996. One of the primary planning goals, as set forth in the Land Use Element of the *General Plan*, is to coordinate land use with circulation, develop other infrastructure facilities, protect agriculture and open space, and allow growth that maintains the County's quality of life (Goal 3-A). Another goal is to adopt and implement an innovative Countywide Growth Management Plan that effectively links land use policy with transportation and other infrastructure improvements (Goal 3-H). To address future Contra Costa circulation needs, the County has developed Road and Transit Network Plans to accommodate the travel demand that would result from assumed year 2005 build-out of the land use plan. Among the roadway projects proposed for maximum improvement is to create a fourth tunnel or "bore" and carpool bypass lanes for the Caldecott Tunnel.

City of Oakland General Plan. Strategic policies and actions related to land use planning and goals are described in the Land Use and Transportation Element of the *City of Oakland General Plan*, adopted in March 1998. The plan offers an agenda for change in five principal areas of focus:

Waterfront, Downtown, Industry and Commerce, Neighborhoods, and Transportation and Transit-Oriented Development. The *General Plan* calls for concurrent land use and transportation planning, coordination strategies between service providing agencies, and realization of infrastructure improvements along major routes and corridors to improve Oakland's economy, accessibility, and future prospects. The Caldecott Improvement Project would address transportation goals set forth in the *General Plan*. Specific policy goals relevant to the project are to:

- Reduce congestion and improve traffic flow by developing a better-integrated road system that provides increased mobility for residents, business, and visitors;
- Promote and participate in local and regional strategies to manage traffic supply and demand where unacceptable levels of service exist or are forecast to exist; and
- Provide adequate funding for needed transportation facilities, services, and related investments.

City of Orinda General Plan. As described in the Circulation Element of the *City of Orinda General Plan*, adopted in May 1987, land use planning goals and policies are strongly determined by existing circulation constraints. Circulation challenges that affect land use in Orinda include difficult traffic circulation along State Route 24, which is used for all trips (except BART travel) through Orinda and most trips within Orinda; inadequate residential development potential along the narrow roads that serve residential neighborhoods; insufficient downtown parking; and difficult traffic circulation within and around the Crossroads and Village sections of downtown. Addressing these circulation challenges is one of the primary goals of Orinda's land use planning efforts.

City of Berkeley General Plan. The *City of Berkeley General Plan*, adopted in April 2002, identifies seven major planning goals designed to "establish and maintain Berkeley as a sustainable community that promotes social equity, environmental quality, and economic prosperity to meet the needs of the present without compromising the needs of future generations":

- Goal 1: To preserve Berkeley's unique character and quality of life;
- Goal 2: To ensure that Berkeley has an adequate supply of decent housing, living-wage jobs, and businesses providing basic goods and services;
- Goal 3: To protect local and regional environmental quality;
- Goal 4: To maximize and improve citizen participation in municipal decision-making;
- Goal 5: To create a sustainable Berkeley;
- Goal 6: To make Berkeley a disaster-resistant community that can survive, recover from, and thrive after a disaster; and
- Goal 7: To maintain Berkeley's infrastructure, including streets, sidewalks, buildings, and facilities; storm drains and sanitary sewers; and open space, parks, pathways, and recreation facilities.

The following transportation-related policy goal in the *City of Berkeley General Plan* is relevant to the proposed project:

> Policy T-18: Level of Service. When considering transportation impacts under the California Environmental Quality Act, the City shall consider how a plan or project affects all modes of transportation, including transit riders, bicyclists, pedestrians, and motorists, to determine the transportation impacts of a plan or project. Substantial beneficial pedestrian, bicycle, or transit impacts, or substantial beneficial impacts on air quality, noise, visual quality, or safety in residential areas, may offset or mitigate a substantial adverse impact on vehicle Level of Service (LOS) to a level of insignificance. The number of transit riders, pedestrians, and bicyclists potentially affected will be considered when evaluating a degradation of LOS for motorists.

Impacts

The Caldecott Improvement Project is consistent with local planning goals and policies that have been identified in local regional plans and studies. The project build alternatives would be consistent with the stated objectives of these jurisdictions; however, the No-Build Alternative would not support achievement of these goals.

Avoidance, Minimization and/or Mitigation Measures

The Caldecott Improvement Project is consistent with local planning goals and policies to improve traffic circulation along State Route 24; therefore, no minimization or mitigation measures are recommended.

2.1.1.3 PARKS AND RECREATION

Affected Environment

As listed in Table 2.1.1-3 and shown in Figures 2.1.1-3 and 2.1.1-4, there are 11 city parks, three regional parks, two private golf courses, and one private racquet club in the project study area. An additional six city parks are located within the Berkeley study area. New athletic fields, located in the Gateway Valley and adjacent to State Route 24, are planned for opening in 2009.

Table 2.1.1-3 Existing Park and Recreational Facilities in Project and Berkeley Study Areas

No.	Name	Address/Location	Operated By
City Parks			
1	Garber Park	Claremont Avenue	City of Oakland
2	Rockridge Park	Rockridge Boulevard	City of Oakland
3	Ostrander Park	Broadway Terrace	City of Oakland
4	Gateway Gardens	Between Caldecott Lane and Tunnel Road	City of Oakland
5	Grizzly Peak Open Space	Tunnel Road	City of Oakland
6	Chabot Park	6850 Chabot Road	City of Oakland
7	North Oakland Sports Center	6900 Broadway	City of Oakland
8	Bushrod Park	560 59th Street	City of Oakland
9	Colby Park	61st Street and Colby Street	City of Oakland
10	Orinda Community Center Park	Orinda Way	City of Orinda
11	Pine Grove Sports Field	12 Altarinda Road	City of Orinda
12	Gordon Park	Brookwood Road and Spring Road	City of Orinda
13	Mini Park	Brookwood Road and Moraga Way	City of Orinda
14	San Pablo Park	2800 Park Street	City of Berkeley
15	Grove Park	1730 Oregon Street	City of Berkeley
16	Willard Park	2730 Hillegass Avenue	City of Berkeley
17	Oak Park	35 Domingo Avenue	City of Berkeley
Regional Parks			
18	Lake Temescal Regional Recreation Area	Broadway and Warren Freeway	EBRPD
19	Claremont Canyon Regional Preserve	Claremont Avenue	EBRPD
20	Sibley Volcanic Regional Preserve	Skyline Boulevard	EBRPD
Private Recreational Facilities			
21	Claremont Country Club	5295 Broadway Terrace	Privately Operated
22	Chabot Canyon Racquet Club	7040 Chabot Road	Privately Operated
23	Orinda Country Club	305 Camino Sobrante	Privately Operated
Source: Parsons 2005			

Figure 2.1.1-3 Parks and Recreational Facilities in the Project Study Area

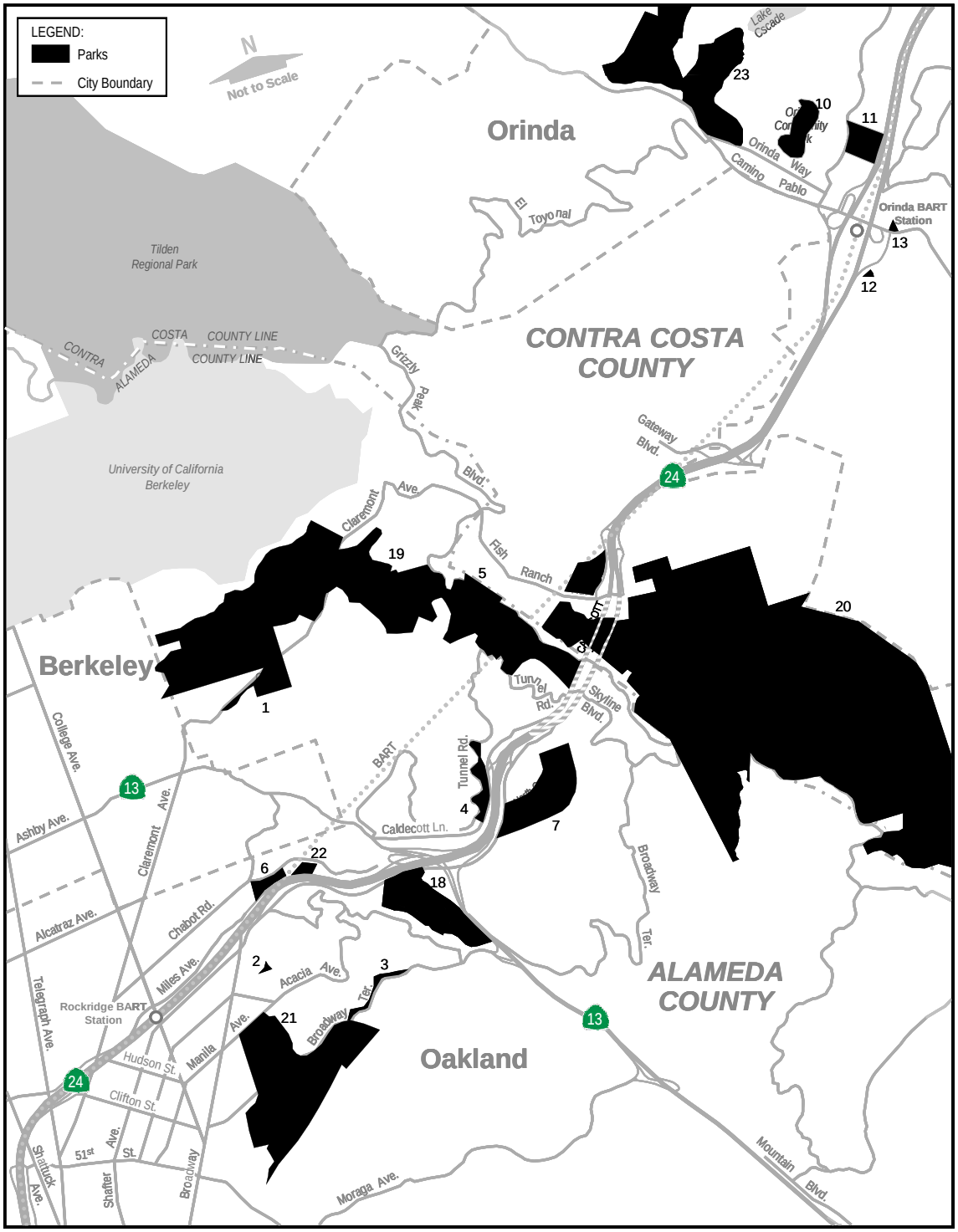


Figure 2.1.1-4 Parks and Recreational Facilities in the Berkeley Study Area

Impacts

Because the project would reduce delay and increase mobility, access to parks and recreational facilities within the project vicinity would be enhanced. No negative impacts to parks and recreational facilities would occur as a result of the Caldecott Improvement Project. The proposed fourth bore on the northern alignment, like the existing most northerly bore and BART tunnel would pass underneath the Grizzly Peak Open Space and the Sibley Volcanic Regional Preserve, both owned by the East Bay Regional Park District. There would be no use of the overhead land. The FHWA does not consider subsurface facility as "use" and thus has determined that the northern alignment (both two- and three-lane alternatives) of the proposed Caldecott Improvement Project would not constitute a "use" of publicly owned land under Section 4(f) of the U.S. Department of Transportation Act of 1966 [see Appendix B: Resources Evaluated Relative to the Requirements of Section 4(f)].

There are some parks that could potentially be sensitive to noise, which could be the type of proximity impact resulting in constructive use. However, the noise analysis for the project concluded that the build alternatives would result in a minimal level of noise increase and therefore, there would not be constructive use with the build alternatives.

As described in Section 1.2.7, Alternatives Considered but Eliminated from Further Discussion, southern alignment alternatives previously evaluated would have required the use of Section 4(f) lands. These alternatives were eliminated from further consideration for this and the other various reasons.

Avoidance, Minimization and/or Mitigation Measures

As there would be no impacts to parks and recreational facilities, no mitigation is proposed.

2.1.2 Growth

2.1.2.1 REGULATORY SETTING

The California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) require that the potential growth inducement impacts of the project be evaluated during the environmental review process. The National Environmental Policy Act (NEPA) requires consideration of indirect effects in environmental review. Indirect effects are defined as effects caused by the project and occurring later in time or farther removed in distance, but still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8).

The information presented in this section is taken from the technical report, *Growth Inducement Analysis for the Caldecott Improvement Project, Final Report* (Parsons, 2005).

2.1.2.2 AFFECTED ENVIRONMENT

Methodology

The growth inducement and indirect effect assessment examined the relationship of the project to economic and population growth or to the construction of additional housing in the project area. This includes the potential for the project to facilitate or accelerate growth beyond planned developments, change growth rates, or induce growth to shift from elsewhere in the region. Although the impact on residential growth was the primary focus of the growth study, the effect of the project on commercial growth was also considered. The assessment addressed the following three sets of questions:

1. What is the reasonably foreseeable growth and land use change without the project? What is it with the project?
2. To what extent will the project influence the overall amount, type, location, or timing of that growth?
3. Will project-related growth put pressure on or cause impacts to environmental resources of concern?

The project's influence on area growth and other indirect effects was considered within the context of other relevant factors such as relative cost availability of housing, availability of amenities, local and regional growth policies, and development constraints. The effects of changes in access time on the growth pressures of sample residential areas were analyzed in depth through use of a gravity model, which compared the relative accessibility to all jobs in the region with and without the proposed project. The results of the analyses were presented to and corroborated by an independent expert panel of local and state planners and real estate developers from both ends of the tunnel. The growth study followed the Transportation Research Board's peer-reviewed growth research approach of

Hirschman and Henderson.2 The information presented in this section is taken from the technical report, Growth Inducement Analysis for the Caldecott Improvement Project, Final Report (Parsons, 2005).

Commute Patterns

The traffic pattern along State Route 24 through the Caldecott Tunnel reflects commute trips from the residential communities east of the tunnel in Contra Costa County to employment opportunities in Alameda County and San Francisco west of the tunnel. While there is a "reverse" commute from west side residences to east side jobs in the I-680 corridor, there is almost twice as much traffic in the primary direction commute.

Currently there are three separate tunnels or "bores" that comprise the Caldecott Tunnel, each with two lanes. During peak periods, four lanes are open in the primary commute direction and two lanes in the reverse commute direction. This operating arrangement results in average delays of eight to 16 minutes for vehicles in the primary commute direction and two to six minutes in the reverse commute direction. The westbound p.m. (reverse commute direction) traffic currently experiences the highest of these delays. Delays are measured between I-580 and I-680 and represent the excess time incurred over the 21 kilometers (13 miles) compared with a freeflow speed of 80 km/h (50 mph) within the tunnel and 105 km/h (65 mph) outside of the tunnel.

Traffic in the State Route 24 corridor is expected to grow in the future and to result in increased delays through the tunnel, particularly in the reverse commute direction. Based on 2032 traffic data presented in Section 2.1.5.2, Traffic Forecasts, delays at the unimproved tunnel are projected to approach 60 minutes for the eastbound a.m. reverse commute direction and to surpass 40 minutes in the westbound p.m. reverse commute direction. Delays in the primary commute direction, which will increasingly occur at multiple locations along the State Route 24 corridor from I-580 to I-680, would stay about the same in the eastbound p.m. primary commute direction but would rise substantially from less than 8 minutes to over 30 minutes for the westbound a.m. primary commute direction. Adding a fourth bore to the tunnel would eliminate delays in the reverse commute direction. Delays in the primary commute direction would remain about the same or increase by up to two minutes, depending upon the alternative and direction.

The communities on either end of the Caldecott Tunnel have developed considerably in the past few decades. The cities of Berkeley, Emeryville, Piedmont, and Oakland on the west end of the Caldecott Tunnel in Alameda County are relatively built out. The communities on the east end of the tunnel in Contra Costa County also have limited potential for growth. Those closest to the east end of the tunnel, like Orinda, Moraga, and Lafayette, and along the I-680 corridor, like Concord and San Ramon, are now reaching build-out as the last remaining lands are developed.

A highway improvement project like the Caldecott Improvement Project could potentially enhance the accessibility of commuters to jobs in the project corridor. While the availability of land in northern Alameda County and central Contra Costa County is limited, a growth inducement study was performed to understand how the change in accessibility due to the proposed project would affect growth and other indirect affects in these areas.

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[2] I. Hirschman and M. Henderson, "Methodology for Assessing Local Land Use Impacts of Highways." *Transportation Research Record 1274*, Transportation Research Board, Washington, DC. 1990.

Expected Growth and Land Use Change

The Association of Bay Area Governments (ABAG) is the regional agency with responsibility for defining and projecting land use in the San Francisco Bay Area. ABAG's Projections 2005 define the current land use and expected future regional land use and growth for the region, including the State Route 24 corridor that is the focus of this analysis. The Metropolitan Transportation Commission (MTC) develops corresponding regional travel demand projections. The Contra Costa Transportation Authority travel demand model used for this document conforms to the MTC model and is based on a hybrid combination of ABAG's Projections 2002 and 2003. This model was the most up-to-date suitable travel demand model available when the forecasting effort began. While not specific to particular transportation improvement projects, ABAG's projections generally assume a dynamic transportation environment in which the regional transportation network is adequate to maintain the economic vitality of the Bay Area. The projections generally balance the growth plans of the local jurisdictions with the expected economic and demographic trends of the region. Travel demand projections, on the other hand, are based on specific assumptions about transportation improvements. These two sets of regional projections are used throughout this document,for example., as the basis for the corridor traffic projections in Section 2.1.5, Traffic and Transportation/Pedestrian and Bicycle Facilities, and for the cumulative impacts analysis in Section 2.5, Cumulative Impacts, as well as the basis for this analysis of growth and other indirect effects.

Because the ABAG land use projections do not specifically include the proposed project, they define the reasonably foreseeable growth and land use change in the corridor without the project, subject to the conclusions of the following section, 2.1.2.3, Impacts. See Table 2.1.3-1, 2000-2030 Population, Housing and Employment Growth, for population and job projections by corridor jurisdictions. The following section considers the other questions outlined above, including whether the proposed project would cause reasonably foreseeable changes in these land use and growth projections.

2.1.2.3 IMPACTS

Six residential locations, as shown in Figure 2.1.2-1, were selected for testing the growth inducement and other indirect effects of the project. These areas were selected based on the following considerations:

1. Potential effect from improved accessibility to jobs;
2. Perceived concerns of growth inducement potential; and
3. Remaining built-out potential.

The locations represent five communities in central Contra Cost County and one in northern Alameda County. The six areas are Berkeley, Orinda, Moraga, Lafayette, Concord, and Dougherty Valley/San Ramon. The average population growth projected by ABAG for these areas is 28 percent between 2000 and 2030.

From Section 2.1.5.2, Traffic Impacts, the average travel time savings through the tunnel that would be obtained in 2032 compared to No-Build conditions would be over 40 minutes in the reverse commute direction, the direction of the worst delays currently. While the amount of travel time savings could theoretically stimulate growth on the west end of the tunnel, there are other factors in addition to traffic conditions that also influence the climate for growth. These other factors include amenities available in the area and the desirability of the residential area. Land use plans of the residential areas and available land are major factors in determining future growth. In this case, all of the communities close to the tunnel are relatively built out and plan to rely on carefully controlled infill growth to serve their additional housing needs over the next 20 or 30 years. For example, Berkeley plans to limit growth to intensified residential development along major transit corridors. Most of Orinda's growth potential will be limited to 400 planned multi-family dwellings in the

Gateway interchange area. These types of land use controls would ensure that the Caldecott Improvement Project would not stimulate unplanned growth. Comparison of current growth trends and accessibility to jobs suggests that accessibility to jobs is not a major factor in current and projected residential growth patterns for the relatively built-out communities that are close to the Caldecott Tunnel. This conclusion was supported by the expert panel, which agreed that the proposed project would not induce unplanned growth, but would help support planned growth.

The expert panel also considered whether the proposed project would have an adverse effect on commercial growth and concluded that it would help sustain the economic vitality of the region, especially the Lamorinda area. Conversely, not expanding the tunnel could adversely affect the economic vitality of the region, especially the Lamorinda area, because growing congestion through the tunnel would reduce access in the reverse commute direction.

While the conclusions of this study rest upon its research and the expert panel, the findings are compatible with those in the literature. Some studies have shown a correlation between highway expansion and residential growth, but they acknowledge the role of other factors and that the importance of accessibility can be limited. A recent study by Cervero found, for example, that areas with relatively high incomes attracted growth and that land use controls or opposition to growth could negate the otherwise large importance of improved accessibility[3]. A recent study by Zondag and Pieters states that, based on empirical findings, "the role of accessibility is significant but small compared with the effects of demographic factors, neighborhood amenities, and dwelling attributes in explaining residential location choices"[5]. A study by Martin Wachs, et al, supports this finding[6]. In their study, choices of residential location were found to be based upon several factors in addition to the home-work commute, such as quality of neighborhood and schools and perceived safety.

In summary, growth management policies and limited land availability in those areas where commuters would realize the greatest potential travel time savings, when compared to other study areas, would tend to discourage accelerated residential growth. Conversely, areas farther out that do possess sufficient land for growth are too far away to be influenced by the travel time savings that would result from the project. This growth inducement study concluded that the Caldecott Improvement Project would support planned growth, but not induce unplanned growth, either in absolute amount or rate, in northern Alameda County and central Contra Costa County.

Because the change in growth pressures with the proposed project would be small and constrained by growth management policies and limited land availability, there would be no reasonably foreseeable change in the growth and land use for the corridor as compared with the baseline Projections 2003 from ABAG. The overall amount, type, location, or timing of the growth is expected to be the same with and without the project, with one exception: without the project, increased traffic congestion by 2032 would likely reduce the economic vitality of commercial areas at both ends of the tunnel, especially those of the Lamorinda area. This could potentially lead to less commercial job growth for these areas than forecast in ABAG's Projections 2005. Finally, because the project is not expected to increase growth, it would not put pressure on or cause growth-related impacts to environmental

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[3] Robert Cervero, Road Expansion, Urban Growth, and Induced Travel, a Path Analysis, Journal of the American Planning Association, Vol. 69, No. 2, Spring 2003.

[5] Barry Zondag and Marits Pieters, Influence of Accessibility on Residential Location Choice, Transportation Research Record 1902, Transportation Research Board 2005

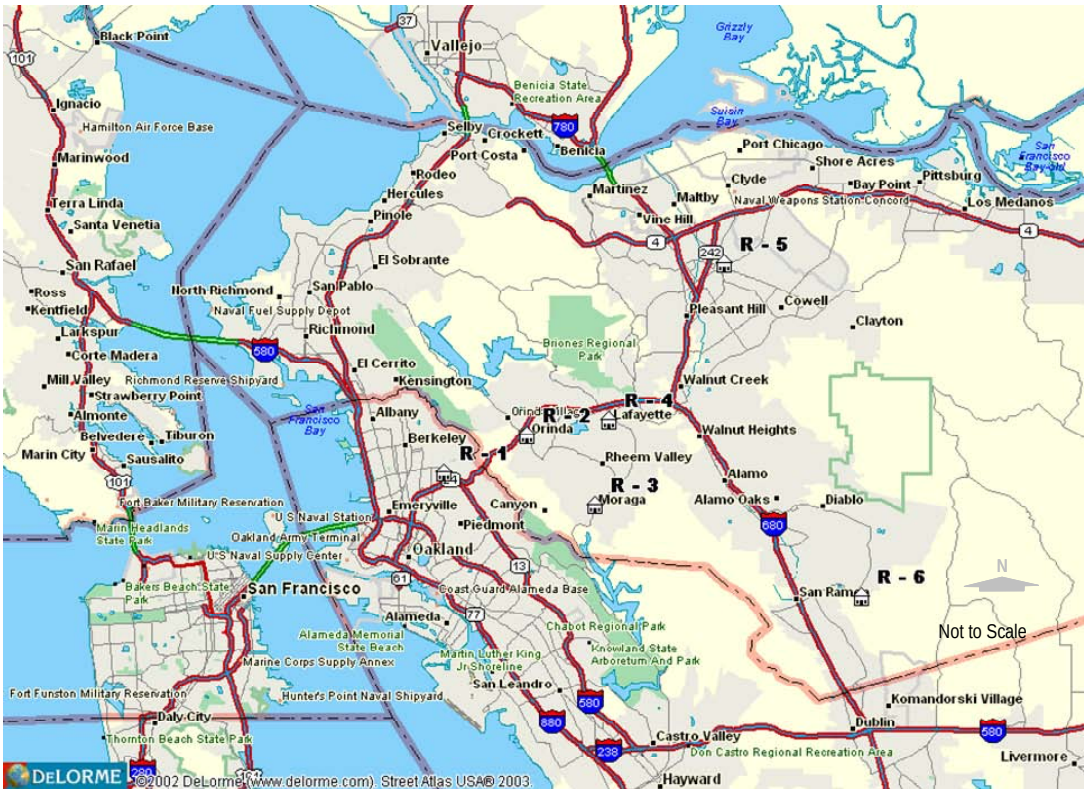
[6] Martin Wachs, et al, The Changing Commute: A Case Study of the Jobs/Housing Relationship Over Time, University of California Transportation Center (UCTC) No 167 Working Paper, 1993

resources of concern. The cumulative effects of the proposed project on specific environmental resources of concern are addressed in Section 2.5, Cumulative Impacts.

2.1.2.4 AVOIDANCE, MINIMIZATION AND/OR MITIGATION MEASURES

The Caldecott Improvement Project would not induce unplanned growth in the area; therefore, no minimization or mitigation measures are recommended.

Figure 2.1.2-1 Residential Areas Studied for Growth Inducement Effects of the Project



2.1.3 Community Impacts

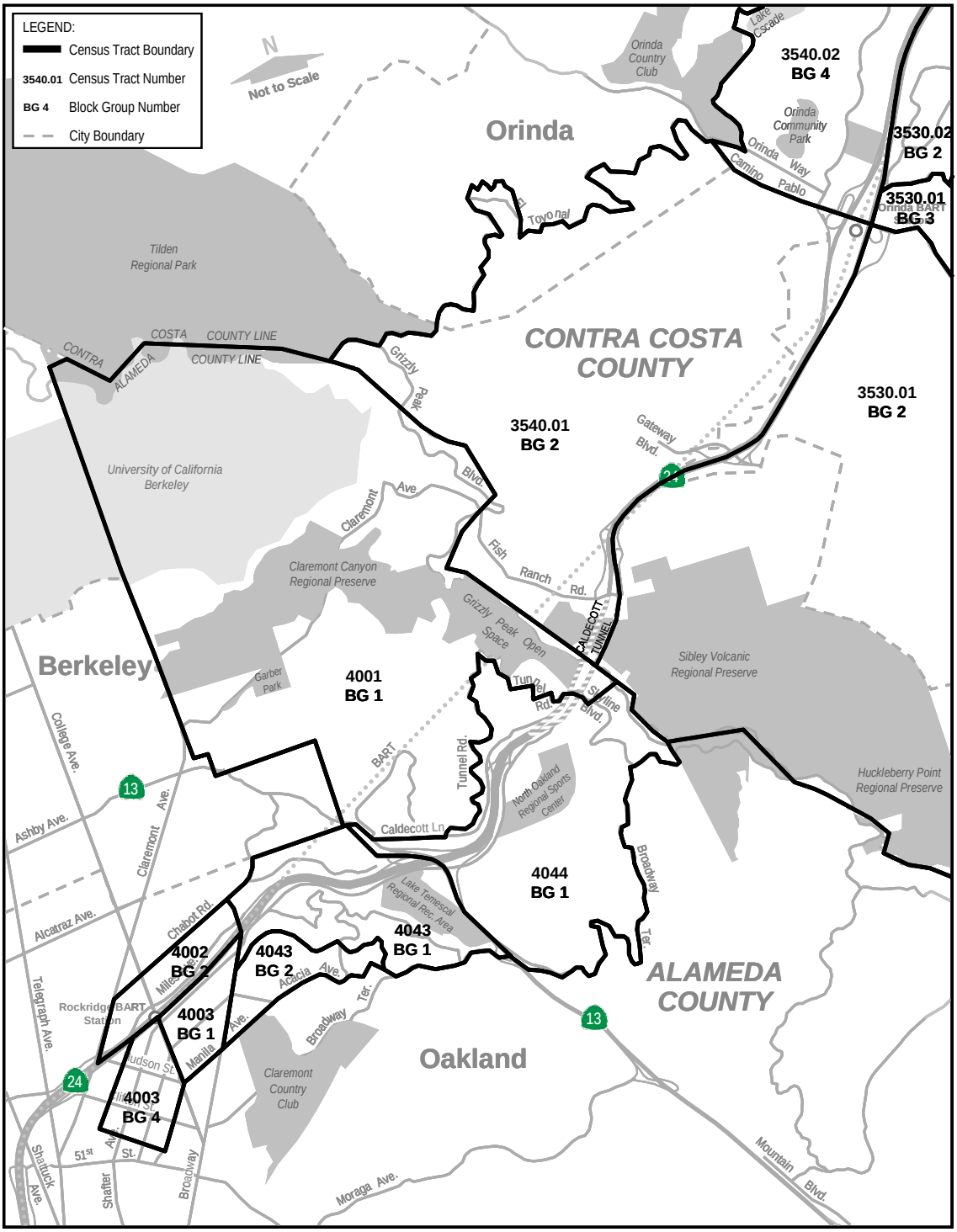
This section identifies and analyzes the existing and projected demographic characteristics of the project and Berkeley study areas, considering factors such as population, housing, and employment growth; household size and composition; ethnic composition; and household income within the affected community. Also examined in this section are community/neighborhood characteristics, community cohesion, public services and facilities, and environmental justice within the project and Berkeley study areas.

2.1.3.1 COMMUNITY CHARACTER AND COHESION

<u>Affected Environment</u>

Demographic characteristics of the affected environment are derived from 2000 U.S. Census Data and *ABAG Projections 2005: Forecasts for the San Francisco Bay Area to the Year 2030*. Census tracts for the project and Berkeley study areas are identified in Figures 2.1.3-1 and 2.1.3-2, respectively.

Figure 2.1.3-1 Socioeconomic Census Tracts in the Project Study Area



Population, Housing, and Employment Growth. Existing and projected population, housing, and employment for Alameda County, Contra Costa County and the cities of Oakland, Orinda and Berkeley are shown in Table 2.1.3-1.

Population. According to ABAG 2005 projections, Alameda County and Contra Costa County are expected to experience population growth rates of 31 percent between 2000 and 2030. In the same period, the City of Oakland and the City of Berkeley anticipate lower growth rates of 29 percent and 16 percent, respectively, while the City of Orinda is expected to experience a relatively modest growth rate of nine percent.

Housing. Between 2000 and 2030, the growth in study area households is projected to be comparable to that of population, ranging from a high of 33 percent in Contra Costa County to lows of 14 percent and 11 percent in the City of Berkeley and the City of Orinda, respectively.

Figure 2.1.3-2 Socioeconomic Census Tracts in the Berkeley Study Area

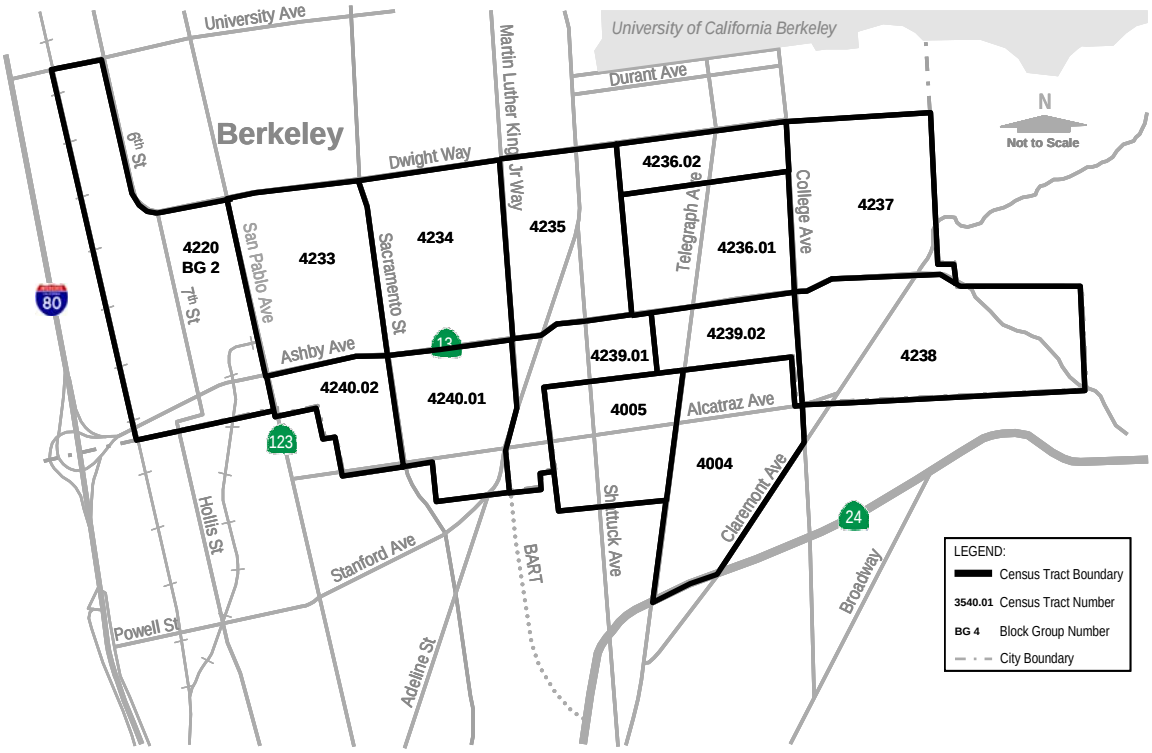


Table 2.1.3-1 2000-2030 Population, Housing and Employment Growth

Geographic Area	Population			Households			Employment (Jobs)		
	2000	2030	% Change	2000	2030	% Change	2000	2030	% Change
Alameda County	1,443,741	1,884,600	31%	523,366	677,400	29%	750,160	1,088,870	45%
Contra Costa County	948,816	1,244,800	31%	344,129	457,120	33%	371,310	543,860	46%
City of Oakland	399,484	516,900	29%	150,790	195,690	30%	199,470	279,340	40%
City of Orinda	17,599	19,100	9%	6,596	7,330	11%	6,230	6,750	8%
City of Berkeley	102,743	119,000	16%	44,955	51,470	14%	78,320	83,400	6%
Source: ABAG Projections 2005									

Employment. Between 2000 and 2030, projected growth in study area employment is expected to be more rapid than that of population and households, with the number of jobs rising by 45 percent in Alameda County, 46 percent in Contra Costa County, and 40 percent in the City of Oakland. The City of Orinda and the City of Berkeley will experience slower employment growth rates of eight percent and six percent, respectively.

Household Size and Composition. The U.S. Census Bureau defines a household as a group of people, related or otherwise, living together in a dwelling unit. Table 2.1.3-2 compares household characteristics in the study area to those in Alameda County, Contra Costa County and the cities of Oakland, Orinda and Berkeley.

According to 2000 U.S. Census Data, there were 6,543 households in the project study area, with an average size of 2.36 persons per household. As compared to the project study area, Alameda County, Contra Costa County, the City of Oakland, and the City of Orinda had higher average household sizes, ranging between 2.67 and 2.76 persons. The City of Berkeley and the Berkeley study area had smaller average household sizes of 2.29 and 2.23 persons per household, respectively.

Sixty-four percent of households in the project study area were family households, a lower percentage than in Alameda County, Contra Costa, and the City of Orinda, where family households make up 65 percent, 70 percent, and 79 percent of households, respectively. The percentage of family households is comparatively low in the City of Oakland, 57 percent, and in the City of Berkeley and the Berkeley study area, family households makeup 41 percent.

Table 2.1.3-2 Household Size and Composition

Geographic Area	Number of Households	Average Household Size	Total Number of Families	% of Family Households
Alameda County	523,366	2.76	339,096	65%
Contra Costa County	344,129	2.76	242,233	70%
City of Oakland	150,790	2.65	86,347	57%
City of Orinda	6,596	2.67	5,241	79%
City of Berkeley	44,955	2.29	18,646	41%
Project Study Area	6,543	2.36	4,205	64%
Berkeley Study Area	19,223	2.23	7,786	41%
TOTAL STUDY AREA	25,766	2.26	11,991	47%
Source: 2000 U.S. Census Data				

Ethnic Composition. The ethnic profile of the existing population in the study area is derived from U.S. Census Bureau 2000 data. The ethnic categories used are White, Black/African American, American Indian and Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, Hispanic, and Other.

As shown in Table 2.1.3-3, 21 percent of the population in the project study area is part of an ethnic minority group. Alameda County, Contra Costa County, and the City of Oakland are ethnically more diverse than the project study area; the City of Orinda is less diverse. Within the City of Berkeley and the Berkeley study area, the percentage of ethnic minority residents represented 55 percent and 46 percent of the population, respectively.

Table 2.1.3-3 Ethnic Composition

Study Area	Total Persons	White	%	Black/African American	%	American Indian/ Alaska Native	%
Alameda County	1,443,741	591,095	41%	211,124	15%	5,306	0.37%
Contra Costa County	948,816	549,409	58%	86,851	9%	3,648	0.38%
City of Oakland	399,484	93,953	24%	140,139	35%	1,471	0.37%
City of Orinda	17,599	14,857	84%	79	0%	11	0.06%
City of Berkeley	102,743	56,691	55%	13,707	13%	293	0.29%
Project Study Area	15,449	12,192	79%	471	3%	23	0.15%
Berkeley Study Area	42,901	19,908	46%	10,600	25%	141	0.33%
TOTAL STUDY AREA	58,350	32,100	55%	11,071	19%	164	0.28%

	Asian	%	Native HI/ Other Pac. Isl.	%	Other	%	Hispanic	%
Alameda County	292,673	20%	8,458	0.59%	61,175	4.24%	273,910	19%
Contra Costa County	102,681	11%	3,157	0.33%	35,294	3.72%	167,776	18%
City of Oakland	60,393	15%	1,866	0.47%	14,195	3.55%	87,467	22%
City of Orinda	1,613	9%	7	0.04%	472	2.68%	560	3%
City of Berkeley	16,740	16%	121	0.12%	5,190	5.05%	10,001	10%
Project Study Area	1,677	11%	12	0.08%	475	3.07%	599	4%
Berkeley Study Area	5,324	12%	67	0.16%	2,320	5.41%	4,541	11%
TOTAL STUDY AREA	7,001	12%	79	0.14%	2,795	4.79%	5,140	9%
Source: 2000 U.S. Census Data								

Within the project study area, Asian residents represent the greatest percentage of ethnic minority residents, constituting 11 percent of the total population. This is comparable or higher than the percentage of Asian residents in Contra Costa County and the City of Orinda, but lower than the percentage in Alameda County, the City of Berkeley, and the Berkeley study area.

Black/African-American residents make up less than three percent of the total population in the project study area and the City of Orinda. By contrast, in Alameda County, Contra Costa County, and the City of Oakland, they make up 15 percent, nine percent, and 35 percent of the population, respectively. The percentage of Black or African-American residents in the City of Berkeley and the Berkeley study area is 13 percent and 25 percent, respectively.

Hispanic residents make up less than five percent of the population in the project study area and City of Orinda; approximately 20 percent of the population of Alameda County, Contra Costa County, and the City of Oakland; and approximately 10 percent in the City of Berkeley and the Berkeley study area.

Household Income. Table 2.1.3-4 provides information on household income for the project study area, Alameda County, Contra Costa County, the City of Oakland, the City of Orinda, the City of Berkeley, and the Berkeley study area. The 2000 median household income was $104,694 in the project study area, substantially higher than that of Alameda County, Contra Costa County, and the City of Oakland. In the City of Orinda, however, median household income was higher than in the study area. Within the City of Berkeley and the Berkeley study area, median household income was $44,485 and $38,235, respectively.

In the City of Orinda and the project study area, less than four percent of households lived below the poverty level, as compared to 9.82 percent in Alameda County, 6.61 percent in Contra Costa County, 16.09 percent in the City of Oakland, 18.35 percent in the City of Berkeley, and 19.63 percent in the Berkeley study area.

Community/Neighborhood Characteristics. The proposed project alignment would pass through portions of neighborhoods in the planning subareas of Alameda County, Contra Costa County and the cities of Oakland and Orinda. Planning areas and neighborhoods in the project and Berkeley study areas are described below.

Alameda County Planning Areas. The *Alameda County General Plan* includes planning goals, objectives, policies, and programs for the County's 14 cities and six unincorporated subareas. Since the cities retain the authority and primary responsibility for planning matters within their corporate boundaries, the focus of the *General Plan* is on the unincorporated areas of the County. The planning areas that would be most affected by the Caldecott Improvements Project are in the City of Berkeley, the City of Oakland, and the City of Orinda, discussed below.

Table 2.1.3-4 Household Income

Study Area	Median Household Income	% Households Below Poverty Level
Alameda County	$55,946	9.82%
Contra Costa County	$63,675	6.61%
City of Oakland	$40,055	16.09%
City of Orinda	$117,637	2.23%
City of Berkeley	$44,485	18.35%
Project Study Area	$102,352	3.73%
Berkeley Study Area	$38,235	19.63%
TOTAL STUDY AREA	$80,980	15.59%
Source: 2000 U.S. Census Data		

Contra Costa County Planning Areas. Contra Costa County is divided into three distinct planning areas: West County, Central County, and East County. Central County, the planning area that is directly affected by the proposed project, is home to over half the county's population and 10 of its 18 cities.

City of Oakland Planning Areas. The planning areas of the City of Oakland that would be affected most directly by the proposed project are the North and South Hills Area, which create a natural divide between Oakland's urban areas and rural Contra Costa County to the east, and the North Oakland Area, which is intersected by State Route 24. Because both planning areas share boundaries with other jurisdictions, efforts would need to be made to communicate with adjacent cities to achieve transportation objectives.

City of Orinda Planning Areas. The Orinda Planning Area, as determined by the Orinda Planning Commission and City Council and set forth in the *General Plan*, includes the Siesta Valley and other public and private lands west of the City that are currently in open space. In addition to the City, with a total area of 3315 hectares (12.8 square miles), the Planning Area includes 750 hectares (2.9 square miles) of unincorporated area.

City of Berkeley Planning Areas. The City of Berkeley planning areas that would be most affected by the Caldecott Improvement Project are South Berkeley and South Shattuck, due to their proximity to Ashby Avenue, the major arterial connecting the City of Berkeley to State Route 24, the Caldecott Tunnel, and Contra Costa County.

Impacts

Community character and cohesion is defined as the degree to which residents have a sense of belonging to their neighborhood or experience attachment to community groups and institutions as a result of continued association over time. The new transportation facilities would not constitute any

new physical or psychological barriers that would divide, disrupt, or isolate neighborhoods, individuals, or community focal points in the corridor. Because the Caldecott Improvement Project would add a fourth bore alongside the current existing configuration, the communities and neighborhoods adjacent to State Route 24 would not experience a disruption in cohesion.

Avoidance, Minimization, and/or Mitigation Measures

As the Caldecott Improvement Project would have no impact on neighborhoods or community cohesion, mitigation is not warranted.

2.1.3.2 ECONOMIC IMPACTS

This section discusses the effects of the project on the local economy of affected neighborhoods and communities, considering the impacts on tax revenues, employment, and the labor force.

Local Tax Revenue

No relocations or displacements would be necessary for the proposed project, therefore no loss of tax revenue would be recognized in Alameda or Contra Costa counties or the cities of Oakland, Orinda and Berkeley. Economic activity generated by the project during the construction phase is anticipated to benefit the region.

Creation of Jobs and Economic Activity

Table 2.1.3-5 provides an estimate of the number of positions and level of economic activity created by the expenditure of construction funds for the No-Build and Build Alternatives. Estimates are based in part on an input/output study of construction activity in Texas by the Federal Highway Administration (Politano and Roadifer, 1989). Funds created in economic output include the multiplier effect of direct construction being re-spent in service or other sectors of the economy. Economic activity generated by the proposed project is anticipated to benefit the San Francisco Bay Area region and would also follow the labor and material markets for transportation-related construction.

With respect to job creation, the FHWA found nationally in the early 1980s that a one million dollar investment in transportation construction would directly generate 10 on-site, full-time construction jobs (person years of employment [PYE]). This number has been adjusted to 5.5 PYE positions to reflect inflation through 2005. When off-site, construction-related and service-industry-related jobs and related increases in consumer demand (direct, indirect, and induced effects) are considered, the total number of full time PYE positions created rises to about 11.0, adjusting for inflation, for each one million dollars of highway investment.

Compared with the No-Build Alternative, capital costs for construction of the build alternatives would be from $336 to $446 million, exclusive of right-of-way with Alternative 2N being the Preferred Alternative. Construction expenditures would generate approximately 1,900 to 2,500 on-site full-time construction positions (PYE) and 3,700 to 4,900 total PYE, including direct, indirect and induced, as compared to the No-Build Alternative.

The impact of this direct and indirect employment added to the regional economy would be positive.

Table 2.1.3-5 Impacts from Construction Investment in the Caldecott Improvement Project (in millions of 2005 dollars)

Alternative	Construction Value *		Regional Economic Output		Total Earnings		Job Creation (Person Years of Employment)			
							On-Site		Total	
	2N	3N	2N	3N	2N	3N	2N	3N	2N	3N
Build Alternatives	$338 - 372	$406 - 446	$587.41 - $646.49	$705.58 - $775.10	$155.60 - $171.25	$186.90 - $205.32	1,900 – 2,000	2,200 – 2,500	3,700 – 4,100	4,500 – 4,900
No-Build Alternative	N/A		N/A		N/A		N/A		N/A	

* Construction impacts are based on preliminary estimates for construction value, which exclude right-of-way costs and include design, construction management, and agency costs.
N/A =Not Applicable
Sources: A.L Politano and Carol J. Roadifer, Regional Economic Impact Model for Highway Systems, *Transportation Research Record 1229*, Transportation Research Board, Washington D.C., 1989. (Model adjusted to reflect inflation.)
Parsons, 2005.

2.1.3.3 COMMUNITY FACILITIES AND PUBLIC SERVICES

Public services and facilities located in the project and Berkeley study areas, including police and fire; hospital and medical; education; cultural; recreational; religious; and water and sanitation are summarized below.

Affected Environment

Police and Fire. Police protection and traffic enforcement in the project study area are provided by the Alameda County Sheriff's Department, Contra Costa County Sheriff's Department, City of Oakland Police Department, City of Orinda Police Services Department, and the California Highway Patrol. The Oakland Fire Department and the Moraga-Orinda Fire District provides fire protection services and emergency medical rescue services. There are two fire stations within the project study area, one in Oakland and one in Orinda.

Police protection and traffic enforcement in the Berkeley study area are provided by the Alameda County Sheriff's Department, the City of Berkeley Police Department, and the California Highway Patrol. The Alameda County Fire Protection District provides fire protection services and emergency medical rescue services. There are two fire stations within the Berkeley study area.

Schools and Universities. There are five elementary and middle schools in the project study area, located within the Oakland Unified School District. Also located within the project study area are two private high schools: College Preparatory High School in Oakland and Orinda Academy in Orinda. Institutions of higher education include St. Albert's University in Oakland. The Berkeley study area includes six elementary and middle schools and one public high school, located within the Berkeley Unified School District, as well as the University of California Berkeley, Clark Kerr Campus.

Cultural Facilities. The project study area includes one library, two community centers, the Bruns Amphitheater, used by The California Shakespeare Theater, and the Orinda City Hall. The Berkeley study area includes one library, one senior center, one performance venue, and one museum.

Houses of Worship. There are 44 houses of worship of various denominations located in the project and Berkeley study areas.

Impacts

The long-term effect of the proposed project would be to reduce congestion on State Route 24, which would benefit the community facilities identified in Section 2.1.3.3. For example, the proposed project would substantially reduce expected future delays in accessing the Bruns Amphitheater from Contra Costa County by eliminating the westbound traffic queuing through Orinda on State Route 24 in the evening. (See Table 2.1.5-5). Increased mobility through the tunnel will likely cause slight increases in trip making, which could cause some increase in congestion on connecting streets such as Ashby Avenue and Broadway. No public facilities would be displaced by the proposed project. Project construction would have little or no effect on public services. There are no fixed public facilities close enough to the project area to be directly affected by the construction.

Avoidance, Minimization, and/or Mitigation Measures

Impacts to community facilities and public services would be negligible; therefore, no mitigation measures are proposed.

2.1.3.4 ENVIRONMENTAL JUSTICE

Regulatory Setting

Executive Order (EO) 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations), dated February 11, 1994, calls on federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority populations and low-income populations. The U.S. Department of Transportation (DOT) has published a Final DOT Order to establish procedures for use in complying with EO 12898 for its operating administrations, including FHWA. If disproportionately high and adverse impacts would result from the proposed action, mitigation measures or alternatives must be developed to avoid or reduce the impacts, unless the agency finds that such measures are not practicable.

Impacts and benefits of transportation projects result from the physical placement of such facilities, and also from their ability to improve or impede access to and from neighborhoods and other portions of the region. The environmental justice analysis examines whether ethnic minority and/or low-income populations in the project area would experience disproportionately adverse accessibility or other impacts, and if the impacts experienced by such populations would be inconsistent with the benefits created.

All considerations under Title VI of the Civil Rights Act of 1964 and related statutes have also been included in this project. The Department's commitment to upholding the mandates of Title VI is evidenced by its Title VI Policy Statement, signed by the Director, which can be found in Appendix C of this document.

Affected Environment

The project study area includes a variety of neighborhoods and a multi-ethnic population. The ethnic composition for the project study area, as described in Section 2.1.3.1, is comparable to the City of Orinda. As shown in Table 2.1.3-6, the City of Oakland and Alameda and Contra Costa counties are much more diverse than the project study area. The project study area and the City of Orinda also

have a smaller percentage of people living below the poverty level, approximately three percent less than in the City of Oakland and in Alameda and Contra Costa counties as a whole.

The ethnic composition of the Berkeley study area is more diverse than the project study area and the City of Berkeley as a whole. In the Berkeley study area, percentages of low-income populations are slightly higher than the City of Berkeley and 18 percent greater than the project study area.

Impacts

Based on 2000 U.S. Census Data for the project study area, none of the populations in any of the 12 census block groups located adjacent to State Route 24 qualify as environmental justice communities based on ethnicity and/or income level.

Table 2.1.3-6 Minority and Low-Income Populations in the Project and Berkeley Study Areas

	% Minority Population	% Low-Income Population
Alameda County	59.06%	10.86%
Contra Costa County	42.10%	7.54%
City of Oakland	76.48%	19.15%
City of Orinda	15.58%	1.86%
City of Berkeley	44.82%	18.97%
Project Study Area	21.08%	3.34%
Berkeley Study Area	53.60%	21.10%
TOTAL STUDY AREA	44.99%	16.40%
Source: 2000 U.S. Census Data		

Project construction would not directly affect the Berkeley study area or any environmental justice communities in the area. Indirect effects for the Berkeley study area would be minimal, with a slight increase in congestion along Ashby Avenue.

Based on the above discussion and analysis, Alternatives 2N and 3N will not cause disproportionately high and adverse effects on any minority or low-income populations according to EO 12898 regarding environmental justice.

Avoidance, Minimization, and/or Mitigation Measures

As there would be minimal impacts to environmental justice communities in the Berkeley study area, no mitigation is required.

2.1.4 Utilities/Emergency Services

2.1.4.1 UTILITIES

The utility information for the project was gathered from the review of as-built plans, responses from various utility service providers verifying locations of their utilities and from the *Utilities for the Caldecott Tunnel Technical Memorandum* (Parsons, 2005.)

Affected Environment

Utilities within the Caldecott Improvement Project area include electrical, telephone, sanitary sewer and water. Pacific Gas & Electric (PG&E) provides gas and electricity service in the project area. SBC maintains the local telephone service. Water services to the project and Berkeley study areas are provided by the East Bay Municipal Utility District (EBMUD). Wastewater collection within the project study area is handled by the City of Oakland in Oakland and treatment by EBMUD. In Orinda, wastewater collection and treatment within the project study area is handled by the Central Contra Costa Sanitation District. Within the Berkeley study area, these services are provided by EBMUD. Solid waste collection, disposal, and recycling are provided by Waste Management of Alameda County (WMAC) and Pleasant Hill Bayshore Disposal for the respective areas of Oakland and Orinda. Within the Berkeley study area, these services are provided by the City of Berkeley Public Works Department.

Table 2.1.4-1 summarizes the existing utilities within the corridor.

Impacts

The majority of the utilities within the project area are transverse crossings that do not present conflicts to the proposed build alternatives. However, there are some utilities that have been identified for relocation for the project, as noted in Table 2.1.4-1.

Also, there are several existing utility longitudinal encroachments that provide services to the Caldecott Tunnel facilities. These include a 150-millimeter (6-inch) sanitary sewer, and 100- and 200-millimeter (4- and 8-inch) water lines for fire protection systems. No changes are proposed to these utilities.

Construction phase impacts are discussed in a separate section that follows.

Table 2.1.4-1 Existing Utilities

Utility No.	Owner	Facility		Existing Station Location		Relocate		Comments
		Description	Type	From	To	Yes	No	
1	PG&E	Electrical	UG	SR 24 90+00	SR 24 95+50			Seven 5-in plastic conduits.
2	PG&E	Electrical	OH	SR 24 117+00	SR 24 123+00			2 to 4 Electric poles need to be relocated from the Fish Ranch Road on Orinda side as 3W, 12KV overhead electric line runs parallel to Fish Ranch Road north of Rt. 24.
3	SBC	Telephone	UG	SR 24 93+00	SR 24 106+00			2 ducts; parallel to Caldecott Lane.
4	SBC	Telephone	UG	SR 24 109+00	SR 24 110+00			2 ducts located above existing and proposed tunnel. Need for relocation doubtful, but cannot be verified at this time.
5	SBC	Telephone	UG	SR 24 129+00	SR 24 134+00			One duct; parallels SR24 on north side then crosses WB on-ramp and SR24 transversely before paralleling SR24 along south side. Depth unknown-need for relocation doubtful; protection may be required.
6	Caltrans	Sanitary sewer	OH	SR 24 107+50	SR 24 117+50			6-in cast iron pipe provides service to tunnel facilities. Unclear if owner is City of Oakland. Line is carried in air duct of tunnel no. 1, across west portal, and along east side of bridge.
7	Caltrans	Electrical	UG	SR 24 119+00	SR 24 134+00			Various Traffic Operations Systems and electrical boxes need to be relocated from Fish Ranch Road
8	Caltrans	Water	OH	SR 24 107+00	SR 24 117+50			8-inch line, the fire protection system located in twin bore tunnel along north side.
9	Caltrans	Water	OH	SR 24 107+00	SR 24 118+00			4-in cast iron pipe provides fire protection system. Located in single bore tunnel along south side.
10	Caltrans	Storm Drain	UG	SR 24 106+80 & SR 24 134+00				Storm drain needs to be relocated from the Fish Ranch Road on Orinda side and from proposed main line alignment on Oakland side near west portal.
11	Caltrans	Short wave tower	OH	SR 24 107+50				Short wave tower needs to be relocated due to conflict with proposed alignment on Oakland side near west portal.

Avoidance, Minimization, and Compensation Measures

If required, design, construction, and inspection of utilities relocated for the project would be done in accordance with the Department's statutes. Where feasible, relocations would be undertaken in advance of project construction. The Department would coordinate with the affected service provider

in each instance to ensure that work is in accordance with the appropriate requirements and criteria, and to determine who would be the responsible party to perform the utility relocation.

In addition, coordination with the utility providers would continue through final design and construction. Coordination efforts would include planning utility re-routes, identifying potential conflicts, ensuring that construction of the proposed project minimizes disruption to utility operations, and formulate strategies for overcoming problems that may arise.

2.1.4.2 EMERGENCY SERVICES

To the extent that traffic congestion relief is achieved, the construction of either build alternatives would have a beneficial effect on the response time of emergency vehicles using the State Route 24 corridor. Cross passages for emergency evacuation would be constructed between the third and the proposed fourth bore. Closed Circuit television would be provided in both bores to monitor whether persons are in need of assistance during an emergency. Call boxes would be provided. Signs will be posted at the cross passages indicating that assistance should be provided to disabled persons. Handrails will also be provided on one side of the proposed passages. Final details of the proposed cross passages will be determined during the design phase of the project.

During construction, standard procedures are to expedite the passage of emergency vehicles through the work area. Therefore, no substantial direct, indirect, long-term, short-term or unavoidable effects on emergency services will occur.

2.1.5 Traffic and Transportation/Pedestrian and Bicycle Facilities

The majority of the information in this section is from the *Final Operational Analysis Report SR 24 Caldecott Improvement Project*, Caltrans March 2006.

The project will not modify any existing pedestrian or bicycle facilities. Although bikeway improvements are not part of the proposed Caldecott Improvement Project, the Alameda County Congestion Management Agency has completed a feasibility study to address various ways to improve bicycle and pedestrian circulation in the vicinity of the Caldecott Tunnel. The Department and the Contra Costa County Transportation Authority worked closely with the ACCMA to ensure that various alternatives were considered in the study.

2.1.5.1 AFFECTED ENVIRONMENT

Traffic Volumes

According to 2004 data, the average annual traffic volume on State Route 24 near the Interstate 580 (I-580) Interchange was about 142,000 vehicles per day. The average annual traffic volume near Interstate 680 (I-680) was about 190,000 vehicles per day. The truck traffic component is about two to three percent of the total traffic volumes. During the peak weekday periods, the existing bores are operating at capacity level, with traffic backing up in the peak commute direction as well as the off-peak commute direction.

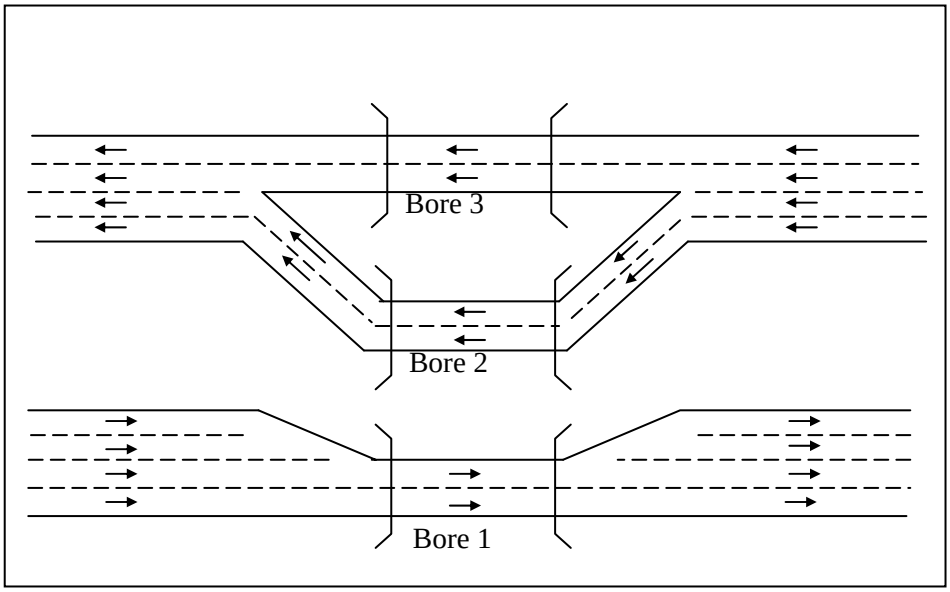
Existing Layout

The corridor serves as a major commute facility for traffic traveling between I-580 and I-680. The corridor extends over a distance of approximately 20.9 kilometers (13 miles) between I-580 to the west and I-680 to the east. The roadway primarily has eight lanes with four lanes in each direction and auxiliary lanes along certain segments. Caldecott Tunnel lies about 6.4 kilometers (4 miles) east of the I-580 junction and about 14.4 kilometers (9 miles) west of the I-680 connector. The first bore

(southern) exclusively provides access for eastbound traffic and the third bore (northern) exclusively provides access for westbound traffic. The direction of travel in the second bore (middle) is reversible to maximize capacity to accommodate peak travel demands during the weekday's morning and evening commute as well as weekend travel.

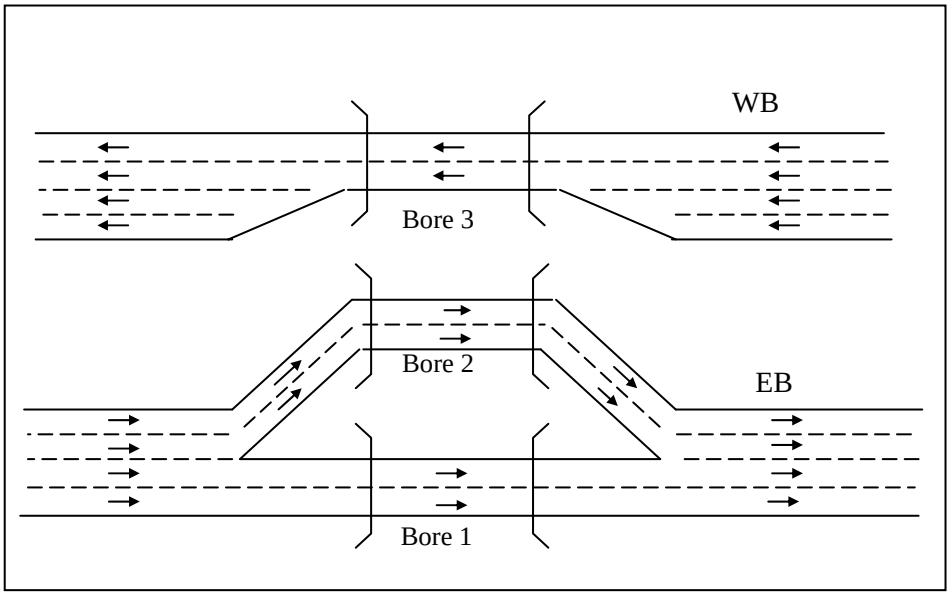
On weekday mornings, the second and third bores are opened to traffic in the westbound direction. The traffic on the outside two lanes (right two lanes) enter into the third bore and the traffic on the inside two lanes (left two lanes) enter into the second bore while the first bore is opened to the eastbound traffic. The eastbound traffic on the four lanes is merged into two lanes before entering the first bore. Upon exiting the tunnel on the east-end, the eastbound traffic is diverged from two lanes back into four lanes (see Figure 2.1.5-1).

Figure 2.1.5-1 Existing and No-Build a.m. Configurations



On weekday afternoons (Figure 2.1.5-2), the reverse scenario is configured in the tunnel. The first and second bores are opened to the eastbound traffic, while the third bore is opened to westbound traffic. The eastbound traffic on the outside two lanes (right two lanes) enter into the first bore and the traffic on the inside two lanes (left two lanes) enter into the second bore while the westbound on the four lanes is merged into two lanes before entering the third bore. Upon exiting the tunnel on the west end, the traffic is diverged from two lanes back into four lanes (see Figure 2.1.5-6). On weekends, the direction of travel in the second bore is often reversed several times per day depending on traffic demands. The speed limit on State Route 24 is 80 kilometers per hour (50 miles per hour) inside the tunnel and 104 kilometers per hour (65 miles per hour) for the remaining corridor.

Figure 2.1.5-2 Existing and No-Build p.m. Configurations



<u>Existing Traffic Conditions</u>

Eastbound a.m.

In the off-peak direction, only the first bore is opened to the eastbound traffic. The traffic approaching the first bore is merged from four lanes into two lanes (see Figure 2.1.5-3). A bottleneck generally develops near the tunnel approach on the west-end and congestion extends about half a mile from the tunnel to near the State Route 13 on-ramp. Peak period is from 6:30 a.m. to about 10 a.m. The travel time through the congestion is generally around six to seven minutes. The delay[7] is approximately 590 vehicle-hours. The traffic, constrained by the uphill grade, remains at capacity flow inside the tunnel. The travel speed generally increases back to the limit as it exits the portal near the east-end of the tunnel. Traffic on the northbound State Route 13 to eastbound State Route 24 connector is also congested due to the congestion on State Route 24. This results in a queue that extends back to the mainline lanes on State Route 13, mostly affecting the right lane traffic flow.

Eastbound p.m.

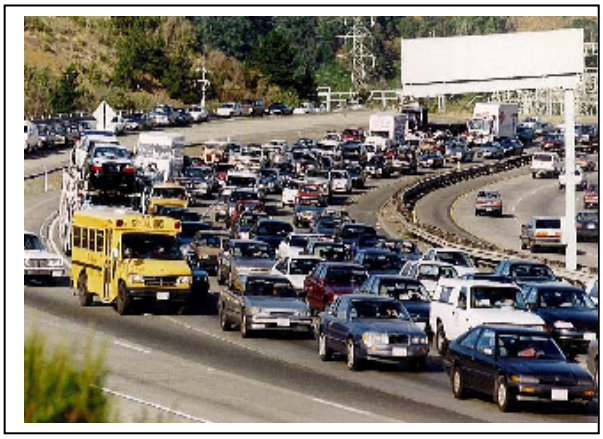
During the evening commute, the first and second bores are opened to the eastbound traffic. With demand exceeding capacity, the traffic congestion begins as early as 3 p.m. Although the congestion fluctuates daily, generally a bottleneck develops near the west-end portal of the tunnel, causing the travel speeds to reduce to less than 80 kilometer/hour (km/h[50 miles/hour(mph)]). By 5 p.m., the congestion could extend as far back to the I-580 Interchange, a distance of 4.8 to 6.4 kilometers (three to four miles) (see Figure 2.1.5-4). Peak period generally starts around 3 p.m. and ends after 7 p.m. The travel time through the congestion is about 15 to 16 minutes with a speed of 16 to 24 km/h (10 to 15 mph). The delay is approximately 2,470 vehicle-hours. The travel speeds generally increases back to the limit as vehicles exit the east end portal of the tunnel. Toward the I-680 junction, traffic is also

[7] Delay is expressed in terms of vehicle-hours. It is defined as the additional travel time over what would be expected for those same vehicles had they been traveling under smooth flow condition at some minimum desired speed (50 mph is used for the traffic technical study). The mainline vehicle-hour delay is the total delay over a given period of time (four-hour peak period for this study).

congested near the northbound I-680 connector for about half-mile with travel speeds of less than 48 km/h (30 mph). The delay is approximately 190 vehicle-hours.

Figure 2.1.5-3 EB a.m. traffic (2 Lanes)

Figure 2.1.5-4 EB p.m. traffic (4 Lanes)



Westbound a.m.

During the morning commute, the second and third bores are opened to the westbound traffic. With demand exceeding capacity, congestion generally develops at three locations. The primary bottleneck occurs at the Caldecott Tunnel approach, near the Fish Ranch Road Interchange just before entering the Caldecott Tunnel. A queue generally extends three to four miles from the tunnel to somewhere between the Camino Pablo and the Acalanes Interchanges (see Figure 2.1.5-5). Peak period generally starts around 6 a.m. and ends after 9 a.m. The travel time through the congestion is around seven to eight minutes with a speed below 48 km/h (30 mph). For the corridor between the I-680 and the I-580 junctions, the delay ranges between 1,000 to 1,500 vehicle-hours. While congestion fluctuates somewhat daily, a secondary bottleneck may occur west of the tunnel near the I-580 connector. A queue generally develops at the connector and extends more than one mile to beyond the Broadway Street off-ramp. The travel speed is around 48 to 64 km/h (30 to 40 mph). The delay is approximately 400 vehicle-hours. East of the Tunnel near the I-680 junction, the traffic may also be congested from somewhere near the Central Lafayette Interchange to the I-680 junction, a distance of one to two miles. The travel speed is less than 48 km/h (30 mph). The delay is approximately 220 vehicle-hours.

Westbound p.m.

For the off-peak direction, only the third bore is opened to westbound traffic. The traffic is merged from four lanes into two lanes (see Figure 2.1.5-6) approaching the tunnel. With only the third bore open, congestion generally begins somewhere between the Fish Ranch Road and the Gateway Interchanges to near the Camino Pablo on-ramp, a distance greater than one-mile. Peak period is between 3 p.m. to 7 p.m. The travel time through the congestion is around two to three minutes with a speed around 32 to 48 km/h (20 to 30 mph). The delay is approximately 1,090 vehicle hours.

Figure 2.1.5–5 WB a.m. traffic (4 Lanes)

Figure 2.1.5–6 WB p.m. traffic (2 Lanes)

The congestion locations during the morning and afternoon peak period are indicated in Figures 2.1.5-7 and 2.1.5-8.

Figure 2.1.5-7 Existing EB & WB Morning Peak Congestion Locations

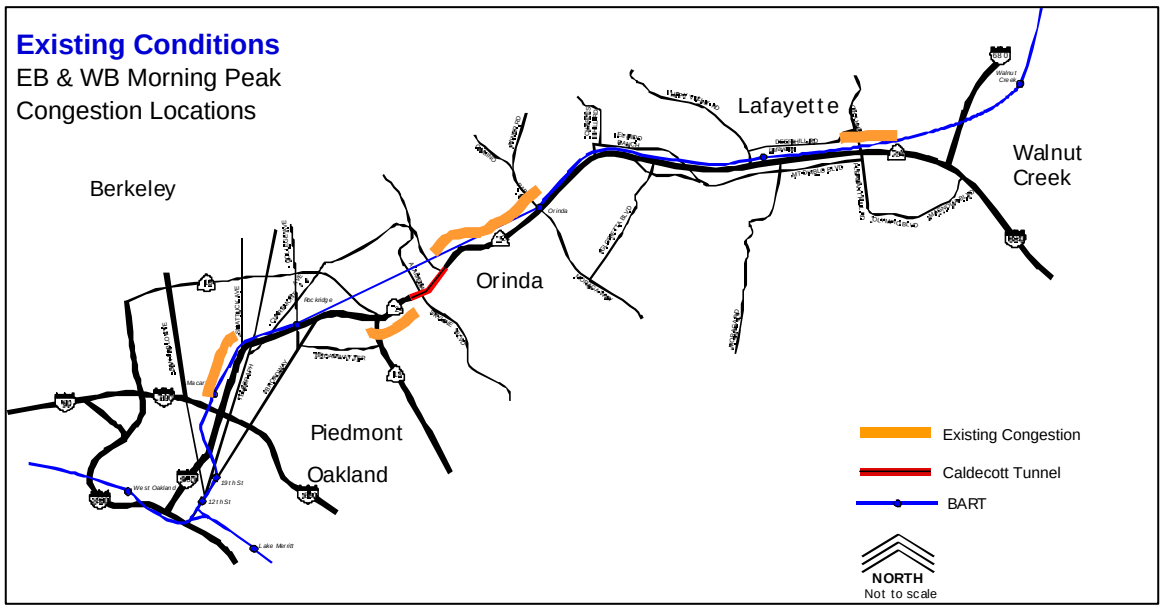
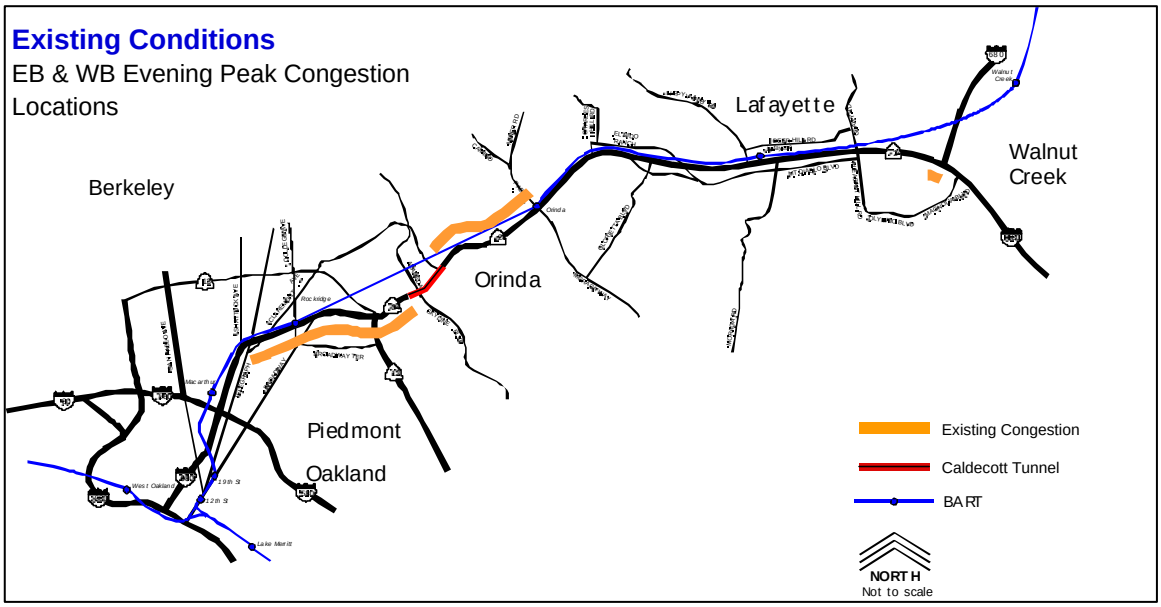


Figure 2.1.5-8 Existing EB & WB Evening Peak Congestion Locations



Weekend

The traffic volumes in each direction on the weekends are roughly equal and less predictable. Traffic congestion usually occurs during the midday hours in the direction being served by only one bore. Congestion is particularly heavy during major weekend events in the surrounding area. The travel direction in the second bore may be switched several times during the day to relieve congestion in either direction.

2.1.5.2 IMPACTS

Traffic Forecasts

The travel demand forecasts were prepared for the project to construct a fourth bore of the Caldecott Tunnel. Year 2032 (Design Year) forecasts included Alternative 2N, the Preferred Alternative, and Alternative 3N as well as a No-Build alternative.

Forecast results have concentrated on the mainline and ramp volumes along the entire length of State Route 24 between the I-680 Interchange in Walnut Creek and the I-580/I-980 Interchange in Oakland. In addition, a series of intersection turning movements at important locations throughout the corridor were also evaluated.

These forecasts used the Contra Costa Transportation Authority (CCTA) travel demand model. In order to improve the model's performance in along State Route 24 in Alameda County, the network and zonal structure for a section of the Alameda County Congestion Management Agency (ACCMA) model adjacent to State Route 24 was inserted into the CCTA model. The model was then validated along the State Route 24 corridor.

The projected traffic for the intersections of concern was taken directly from the travel demand model used to project the traffic for the Caldecott Tunnel project. The model validation was not refined for these intersections and the resulting traffic volumes were not subject to manual fine-tuning. Because of this, the projected design year traffic may be approximate and the difference between the existing traffic and forecasts may be overstated or understated and greater or less than may be seen. If these

forecasts were to be used to design intersection improvements to carry future traffic, the model validation at these intersections would need to be improved and the projections might need some post-model refinement.

However, the intent of this effort was to gauge the trend and general effects at these intersections due to the construction of the fourth bore of the Caldecott Tunnel. The overall traffic patterns forecast by the model are realistic and the general effects of Alternative 2N and 3N on the overall intersections' operations should be realistic.

Analysis of Alternatives

A widely used macroscopic freeway simulation computer program, FREQ12, was used to analyze future traffic conditions. The study limit covered an approximately 20.9-kilometer (13-mile) segment of State Route 24, from the I-580 junction in Alameda County to the I-680 junction in Contra Costa County. The model is calibrated to correlate existing conditions based on field measurements. The analyses were based on a 4-hour peak period forecast for the year 2032. The hours were 6 to 10 a.m. in the morning and 3 to 7 p.m. in the afternoon. Since there is congestion in the peak and off-peak directions, the corridor was analyzed for both directions for the morning and afternoon peak periods. The analyses generally assumed the same capacity per lane for the alternatives with slight adjustments as needed. The capacities on the mainline lanes and on the ramps were 2,100 and 1,500 vehicles per hour per lane respectively. Weaving is engaged and delay calculations on the mainline are calculated based on 80 km/h (50 mph) as free flow speed.

Among performance measures reported by FREQ12, freeway level of service (LOS) is reported in the output. The Year 2000 edition of the Highway Capacity Manual defined six LOSs for basic freeway segments with letters designating each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Congestion and LOS F occur when queues begin to form on the freeway.

The measure used to provide an estimate of LOS is density or the number of vehicles in a given segment, reflecting the maneuverability within the traffic stream. Higher density, representing lower maneuverability, leads to lower LOS designation (Figure 1.1.4-1). Speed and flow or volume are two other interrelated performance measures that might be referenced. LOS thresholds for a basic freeway segment are summarized below.

Table 2.1.5-1 Freeway Basic Segment Level of Service Thresholds

Freeway Segment Level of Service	Density Range (passenger car per mile per lane)
A	0-11
B	>11-18
C	>18-26
D	>16-35
E	>35-45
F	>45

No-Build Alternative

Under the No-Build Alternative traffic configurations would remain unchanged.

No-Build Eastbound a.m. Peak Period

Despite the lack of roadway improvement in the No-Build Alternative, the forecast projects continual demand growth along the corridor and the analysis result reflected this trend. The analysis indicated heavy congestion during the a.m. peak period. Four lanes of traffic would continue to merge into two lanes before entering the first bore and the Caldecott Tunnel would continue to be the bottleneck it currently is. The congestion would cause a queue of 6.4 kilometers (four miles) extending westward from the tunnel to the I-580 Interchange. The analysis predicts an overall average mainline delay of 78 minutes per vehicle (min/veh). The average traffic speed would be about 37 km/h (23 mph). The No-Build condition also resulted in heavy congestion on some on-ramps including the on-ramps from northbound State Route 13 and southbound State Route 13 (Old Tunnel Road). With demand exceeding capacity, the congestion would influence the approaching segments to these ramps. Table 2.1.5-2 shows the No-Build Eastbound a.m. Peak period forecasts.

Table 2.1.5-2 No-Build Eastbound a.m. Peak Period (2032)

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00
580 connector on-ramp to EB 24	2620	2511	2620	1088	65	65	65	7	C	C	C	F
580-980 connector to Claremont Ave off	3068	3083	2525	1579	65	65	52	3	B	B	F	F
Claremont Ave off to Telegraph on-ramp	2188	2073	1475	949	65	65	11	1	A	A	F	F
Telegraph Ave on to Broadway off-ramp	2617	2495	1915	1400	65	65	5	2	A	A	F	F
Broadway off to on-ramp	2267	1441	1225	1190	65	12	2	2	A	F	F	F
Broadway on to SB SR 13 off-ramp	1843	1882	1694	1559	36	3	2	2	F	F	F	F
SB SR 13 off to NB SR 13 on-ramp	1213	881	874	848	6	1	1	1	F	F	F	F
NB SR 13 on to Tunnel Rd off-ramp	2713	2381	2374	2348	5	3	3	3	F	F	F	F
Tunnel Rd off to Tunnel Rd on-ramp	2639	2300	2298	2299	5	4	4	4	F	F	F	F
Tunnel Rd on to Caldecott Tunnel	3800	3800	3798	3799	8	8	8	8	F	F	F	F
Tunnel to Fish Ranch Rd off-ramp	3800	3799	3797	3798	35	35	35	35	F	F	F	F
Fish Ranch Rd off to on-ramp	3800	3800	3798	3799	50	50	50	50	E	E	E	E
Fish Ranch Rd on to Gateway off-ramp	3800	3800	3798	3799	55	55	55	55	C	C	C	C
Gateway off to on-ramp	3778	3764	3761	3765	65	65	65	65	B	B	B	B
Gateway on to Orinda off-ramp	3898	3944	3961	3875	65	65	65	65	B	B	B	B
Orinda off to loop on-ramp	3891	3929	3953	3866	65	65	65	65	B	B	B	B
Orinda loop on to diagonal on-ramp	3902	3948	3964	3876	65	65	65	65	B	B	B	B
Orinda diagonal on to St Stephens off-ramp	3436	3399	3416	3306	65	65	65	65	B	B	B	B
St Stephens off to on-ramp	4336	4428	4417	4257	65	65	65	65	B	B	B	B
St Stephens on to Acalanes off-ramp	4747	4919	4866	4647	65	65	65	65	B	B	B	B
Acalanes off to on-ramp	4664	4822	4768	4589	65	65	65	65	B	C	C	B
Acalanes on to Oakhill off-ramp	4874	5081	4977	4719	65	65	65	65	C	C	C	C
Oakhill off to First St on-ramp	4565	4744	4643	4402	65	65	65	65	B	C	B	B
First St on to Pleasant Hill off-ramp	4955	5163	5083	4793	65	65	65	65	C	C	C	C
Pleasant Hill off to on-ramp	4549	4695	4587	4340	65	65	65	65	B	C	B	B
To SB 680-Mt Diablo Blvd off-ramp	5709	5965	5737	5550	65	65	65	65	B	C	B	B
To Ygnacio Valley off to NB 680 connector off	5264	5447	5207	5073	65	65	65	65	C	C	C	C

No-Build Eastbound p.m. Peak Period

Despite the lack of roadway improvement in the No-Build Alternative, the forecast projects continual demand growth along the corridor and the analysis result reflects this trend. The high demand would cause heavy eastbound congestion in the afternoon commute. A primary bottleneck would develop at the Caldecott Tunnel with secondary bottlenecks near several interchanges east of the tunnel. These interchanges include the Orinda/Camino Pablo Interchange, the St. Stephens Interchange, and the First Street Interchange. A 6.4-kilometer (four-mile) queue would form as a result of the primary bottleneck at the tunnel extending near the I-580 connector with travel speed as low as 16 to 32 km/h (10 to 20 mph) range. The secondary bottlenecks would form an intermittent queue east of the tunnel with lower density (less vehicles per mile) and higher speed ranging between 32 to 48 km/h (20 to

30 mph). Eventually the two queues would merge, forming a continuous queue of more than 14.4 kilometers (9 miles) near First Street Interchange extending to near the I-580 connector.

The peak of the congestion occurs between the hours of 5 to 6 p.m. The overall average mainline delay is about 11 min/veh. The average speed is around 56 km/h (35 mph). Some of the on-ramps including the northbound State Route 13 on-ramp would also have long queues and delay.

Table 2.1.5-3 No-Build Eastbound p.m. Peak Period (2032)

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00
580 connector on-ramp to EB 24	3214	2622	2878	3718	64	43	23	34	C	F	F	F
580-980 connector to Claremont Ave off	6214	5622	5878	6718	63	41	23	30	C	F	F	F
Claremont Ave off to Telegraph on-ramp	5216	4536	4918	5658	65	25	14	16	C	F	F	F
Telegraph Ave on to Broadway off-ramp	6033	5775	5978	6309	65	29	21	21	C	F	F	F
Broadway off to on-ramp	5463	5143	5363	5680	65	20	16	16	C	F	F	F
Broadway on to SB SR 13 off-ramp	6413	6355	6372	6280	65	19	17	14	C	F	F	F
SB SR 13 off to NB SR 13 on-ramp	5045	4749	4876	4734	65	13	13	12	C	F	F	F
NB SR 13 on to Tunnel Rd off-ramp	6375	6249	6376	6234	33	13	14	13	F	F	F	F
Tunnel Rd off to Tunnel Rd on-ramp	6270	6120	6281	6127	25	19	22	19	F	F	F	F
Tunnel Rd on to Caldecott Tunnel	7600	7600	7078	6996	36	33	31	27	F	F	F	F
Tunnel to Fish Ranch Rd off-ramp	7600	7600	7078	6996	53	53	40	29	E	E	F	F
Fish Ranch Rd off to on-ramp	7573	7570	7057	6967	57	57	38	27	D	D	F	F
Fish Ranch Rd on to Gateway off-ramp	7965	8001	7528	7386	56	56	41	32	E	E	F	F
Gateway off to on-ramp	7946	7979	7507	7366	56	56	39	31	E	E	F	F
Gateway on to Orinda off-ramp	7967	8010	7537	7386	56	56	38	32	E	E	F	F
Orinda off to loop on-ramp	6868	6860	6435	6345	63	63	25	21	D	D	F	F
Orinda loop on to diagonal on-ramp	7819	7788	7534	7215	64	50	20	17	C	F	F	F
Orinda diagonal on to St Stephens off-ramp	8140	8287	8193	7755	39	23	22	20	F	F	F	F
St Stephens off to on-ramp	7897	7991	7878	7543	41	39	38	34	F	F	F	F
St Stephens on to Acalanes off-ramp	8228	8400	8298	7922	45	52	47	40	F	E	F	F
Acalanes off to on-ramp	7850	7873	7910	7517	38	46	39	33	F	E	F	F
Acalanes on to Oakhill off-ramp	8303	8338	8400	7977	51	50	52	41	F	E	E	F
Oakhill off to First St on-ramp	7912	7696	7876	7672	46	48	57	35	F	E	F	F
First St on to Pleasant Hill off-ramp	9482	9386	9396	9082	44	45	47	31	F	E	F	F
Pleasant Hill off to on-ramp	8400	8146	8400	8400	52	55	52	52	E	E	E	E
To SB 680-Mt Diablo Blvd off-ramp	9280	9176	9530	9340	57	58	54	56	D	D	E	D
To Ygnacio Valley off to NB 680 connector off	6369	5446	6311	6604	58	63	58	56	E	D	E	E

No-Build Westbound a.m. Peak Period

The analysis indicated significant congestion on westbound State Route 24 during the morning commute. The corridor from I-680 to I-580 would be completely congested. Two primary bottlenecks would occur; one at the Caldecott Tunnel approach just before entering the Caldecott Tunnel near the Fish Ranch Road Interchange, and the other would be at the westbound State Route 24 to I-580 connector. The Caldecott Tunnel approach acts as a bottleneck predominantly because of its uphill grade just before entering the tunnel. The analysis indicated that the overall average delay on the mainline within the study limit is about 35 min/veh. The maximum congestion would extend through the corridor from the I-580 junction to the I-680 junction, a distance of approximately 20.9 kilometers (13 miles). The average travel speed is about 29 km/h (18 mph). There are also ramp delays. With demand exceeding the capacity of the ramps, the traffic stays in the mainline for a longer time and causes delay in entering and exiting the mainline.

Table 2.1.5-4 No-Build Westbound a.m. Peak Period (2032)

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00
SB 680 on	1727	1627	1823	1796	23	4	4	4	F	F	F	F
NB 680 on to Pleasant Hill off-ramp	5676	5476	5672	5426	30	11	12	11	F	F	F	F
Pleasant Hill off to on ramp	4387	4153	4323	4176	26	9	10	9	F	F	F	F
Pleasant Hill on to Lafayette off-ramp	6448	6455	6524	6086	41	18	17	14	F	F	F	F
Lafayette off to on-ramp	4930	4888	4999	4714	37	12	12	11	F	F	F	F
Lafayette on to Bridge (5 lanes)	5791	5858	5889	5464	39	17	17	15	F	F	F	F
Bridge (5 lanes) to Acalanes off-ramp	5791	5858	5889	5464	31	11	11	10	F	F	F	F
Acalanes off to on-ramp	5539	5497	5523	5133	27	10	10	9	F	F	F	F
Acalanes on to St Stephens off-ramp	6170	6187	6223	5754	27	12	12	11	F	F	F	F
St Stephens off to on-ramp	6047	6053	6098	5620	24	12	12	10	F	F	F	F
St Stephens on to Camino Pablo off-ramp	6357	6424	6487	5990	25	15	15	13	F	F	F	F
Camino Pablo off to on-ramp	5229	5194	5328	4912	22	13	14	12	F	F	F	F
Camino Pablo on to Gateway off-ramp	7130	7163	7008	6402	28	20	19	16	F	F	F	F
Gateway off to on-ramp	7111	6994	6835	6374	40	26	24	20	F	F	F	F
Gateway on to Fish Ranch off-ramp	7131	7195	7037	6403	40	26	25	19	F	F	F	F
Fish Ranch Rd off to on-ramp	7053	7044	6883	6321	39	27	25	20	F	F	F	F
Fish Ranch Rd on to Caldecott Tunnel	7083	7085	6914	6351	37	25	24	19	F	F	F	F
Caldecott Tunnel to Caldecott Lane off-ramp	7083	7085	6914	6351	36	25	24	19	F	F	F	F
Caldecott Lane off to on-ramp	6989	6955	6728	6210	36	25	23	19	F	F	F	F
Caldecott Lane on to NB 13 off-ramp	7070	7076	6848	6291	30	20	19	15	F	F	F	F
NB 13 off to SB 13 off-ramp	6584	6531	6252	5924	31	22	20	17	F	F	F	F
SB 13 off to SR 13 on-ramp	5340	5107	4935	4711	22	13	12	11	F	F	F	F
SR 13 on to Broadway Off	6511	6347	6084	5741	24	17	15	13	F	F	F	F
Broadway off to College off-ramp	6123	5889	5699	5402	24	17	16	14	F	F	F	F
College off to Patton on-ramp	5815	5424	5313	5071	21	14	14	13	F	F	F	F
Patton on to Telegraph Ave off-ramp	6235	5745	5574	5301	23	16	15	14	F	F	F	F
Telegraph Ave off to Claremont Ave on-ramp	5327	4853	4645	4617	16	12	11	11	F	F	F	F
Claremont Ave on to WB 24 (3 lanes)	6227	5793	5385	5407	23	18	15	15	F	F	F	F
WB 24 to 580 connector	3560	3560	3560	3560	52	52	52	52	E	E	E	E

No-Build Westbound p.m. Peak Period

The westbound State Route 24 corridor would be congested from the Caldecott Tunnel to the I-680 junction. Similar to the morning commute, the primary bottleneck would be at the Caldecott Tunnel approach, just before entering the Caldecott Tunnel near the Fish Ranch Road Interchange. The analysis indicated that the overall average delay on the mainline within the study limit is about 33 min/veh. With only the third bore serving the westbound traffic, the maximum queue would extend from the Caldecott Tunnel to the I-680 junction, a distance of approximately 13 kilometers (eight miles). The average travel speed is about 31 km/h (19 mph). There are also ramp delays, which are due to the demand over capacity on the ramps.

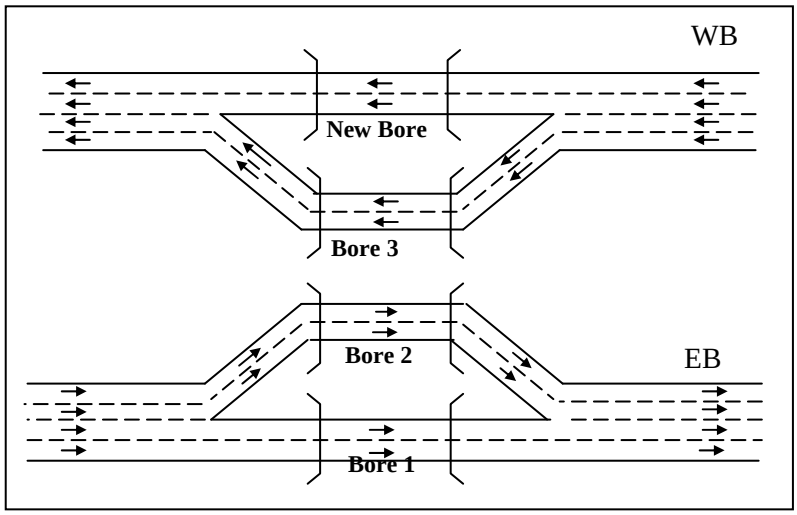
Table 2.1.5-5 No-Build Westbound p.m. Peak Period (2032)

Sub Section Location	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00
SB 680 on	4699	4882	3621	3072	64	64	12	9	C	C	F	F
NB 680 on to Pleasant Hill off-ramp	7907	6957	7163	5921	63	56	19	12	C	F	F	F
Pleasant Hill off to on ramp	6527	5547	5993	5081	64	43	18	13	C	F	F	F
Pleasant Hill on to Lafayette off-ramp	7478	6476	6691	5662	64	32	15	10	C	F	F	F
Lafayette off to on-ramp	5968	4776	4942	4202	65	22	12	9	C	F	F	F
Lafayette on to Bridge (5 lanes)	6599	5427	5462	4640	63	21	15	11	C	F	F	F
Bridge (5 lanes) to Acalanes off-ramp	6599	5427	5462	4640	65	11	10	8	C	F	F	F
Acalanes off to on-ramp	4646	5028	4992	4381	65	9	8	7	F	F	F	F
Acalanes on to St Stephens off-ramp	5048	5458	5410	4769	42	10	10	8	F	F	F	F
St Stephens off to on-ramp	4848	5238	5190	4609	27	9	9	7	F	F	F	F
St Stephens on to Camino Pablo off-ramp	4989	5379	5300	4720	21	10	10	8	F	F	F	F
Camino Pablo off to on-ramp	3350	3618	3750	3439	12	7	8	7	F	F	F	F
Camino Pablo on to Gateway off-ramp	4570	4649	4670	4550	12	9	9	9	F	F	F	F
Gateway off to on-ramp	4370	3319	3231	4310	10	6	6	10	F	F	F	F
Gateway on to Fish Ranch off-ramp	4570	4650	4670	4551	11	11	11	10	F	F	F	F
Fish Ranch Rd off to on-ramp	4450	4411	4420	4430	46	44	45	45	F	F	F	F
Fish Ranch Rd on to Caldecott Tunnel	4500	4500	4500	4500	50	50	50	50	E	E	E	E
Caldecott Tunnel to Caldecott Lane off-ramp	4500	4500	4500	4500	51	51	51	51	E	E	E	E
Caldecott Lane off to on-ramp	4403	4391	4414	4406	65	65	65	65	C	C	C	C
Caldecott Lane on to NB 13 off-ramp	4553	4553	4574	4535	65	65	65	65	B	B	B	B
NB 13 off to SB 13 off-ramp	4290	4280	4321	4284	65	65	65	65	B	B	B	B
SB 13 off to SR 13 on-ramp	3012	2951	3049	3185	65	65	65	65	B	B	B	B
SR 13 on to Broadway Off	3961	3940	3999	3975	65	65	65	65	B	B	B	B
Broadway off to College off-ramp	3682	3651	3742	3705	65	65	65	65	B	B	B	B
College off to Patton on-ramp	3395	3353	3418	3434	65	65	65	65	B	B	B	B
Patton on to Telegraph Ave off-ramp	3705	3693	3758	3674	65	65	65	65	B	B	B	B
Telegraph Ave off to Claremont Ave on-ramp	3299	3233	3328	3276	65	65	65	65	B	B	B	B
Claremont Ave on to WB 24 (3 lanes)	4229	4183	4248	4056	65	65	65	65	B	B	B	B
WB 24 to 580 connector	2890	2904	2988	2761	65	63	62	65	C	C	C	C

Alternative 2N

Alternative 2N would be constructed north of the third bore and would provide two standard-width lanes. The two new lanes would transition to the two right lanes of the existing four-lane sections east and west of the tunnel (see Figure 2.1.5-9). With this alternative, four lanes would be open to eastbound traffic, and four lanes would be open to westbound traffic at all times, eliminating the need of switching the direction of flow in the middle bore and thus increasing safety for both drivers and Department maintenance personnel.

Figure 2.1.5-9 Proposed Two-Lane Bore



Alternative 2N Eastbound a.m. Peak Period

Alternative 2N would add two additional lanes for eastbound traffic during the a.m. peak period. With the added capacity, the analysis indicates that no congestion would occur. The bottleneck at the tunnel would be eliminated. There would be no delay and the traveling speed at the tunnel would be at free flow speed.

Table 2.1.5-6 Alternative 2N Eastbound a.m. Peak Period (2032)

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00
580 connector on-ramp to EB 24	2609	2630	2719	2060	65	65	65	65	C	C	C	B
580-980 connector to Claremont Ave off	3238	3200	3338	2540	65	65	65	65	B	B	B	A
Claremont Ave off to Telegraph on-ramp	2368	2200	2298	1880	65	65	65	65	A	A	A	A
Telegraph Ave on to Broadway off-ramp	2738	2661	2769	2321	65	65	65	65	A	A	A	A
Broadway off to on-ramp	2388	1991	2089	2091	65	65	65	65	A	A	A	A
Broadway on to SB SR 13 off-ramp	2829	2500	2609	2461	65	65	65	65	A	A	A	A
SB SR 13 off to NB SR 13 on-ramp	2199	1500	1790	1752	65	65	65	65	A	A	A	A
NB SR 13 on to Tunnel Rd off-ramp	3699	3000	3290	3252	65	65	65	65	B	A	A	A
Tunnel Rd off to Tunnel Rd on-ramp	3653	2950	3235	3217	65	65	65	65	B	B	B	B
Tunnel Rd on to Caldecott Tunnel	4823	4450	4735	4717	65	65	65	65	C	B	C	C
Tunnel to Fish Ranch Rd off-ramp	4823	4450	4735	4717	55	55	55	55	C	C	C	C
Fish Ranch Rd off to on-ramp	4795	4401	4680	4675	65	65	65	65	C	B	C	B
Fish Ranch Rd on to Gateway off-ramp	4925	4602	4899	4795	65	65	65	65	C	B	C	C
Gateway off to on-ramp	4917	4585	4890	4785	65	65	65	65	C	B	C	C
Gateway on to Orinda off-ramp	4928	4604	4901	4796	65	65	65	65	C	B	C	C
Orinda off to loop on-ramp	4312	3924	4182	4092	65	65	65	65	B	B	B	B
Orinda loop on to diagonal on-ramp	5381	4933	5252	5122	65	65	65	65	B	B	B	B
Orinda diagonal on to St Stephens off-ramp	5821	5444	5733	5532	65	65	65	65	B	B	B	B
St Stephens off to on-ramp	5726	5330	5630	5467	65	65	65	65	C	C	C	C
St Stephens on to Acalanes off-ramp	5946	5600	5871	5646	65	65	65	65	C	C	C	C
Acalanes off to on-ramp	5575	5209	5464	5265	65	65	65	65	C	C	C	C
Acalanes on to Oakhill off-ramp	5966	5659	5944	5684	65	65	65	65	C	C	C	C
Oakhill off to First St on-ramp	5467	5105	5340	5127	65	65	65	65	C	C	C	C
First St on to Pleasant Hill off-ramp	6746	6425	6570	6407	65	65	65	65	C	C	C	C
Pleasant Hill off to on-ramp	6205	5831	5942	5836	64	65	65	65	C	C	C	C
To SB 680-Mt Diablo Blvd off-ramp	7295	7101	7122	6886	64	65	65	65	C	C	C	C
To Ygnacio Valley off to NB 680 connector off	4884	4675	4078	4182	64	64	65	65	C	C	C	C

Alternative 2N Eastbound p.m. Peak Period

Construction of the new bore would not provide additional capacity or traffic lane for eastbound traffic during the p.m. peak period. Yet continual demand growth is projected along the corridor, and the analysis result reflects this trend. The locations of bottlenecks in the eastbound direction for the two-lane alternative would follow the same pattern as the No-Build Alternative. A queue of over 14.5 kilometers (nine miles) long would extend near the Pleasant Hill Road on-ramp to near the I-580 connector. The incremental increase of forecast demand would lead to slightly more congested segments or longer queues when compared to the No-Build alternative. In terms of freeway level of service, there are more LOS F segments in the Build alternative when compared to the No-Build alternative as LOS F operations within a queue are the result of a bottleneck at a downstream point.

The overall average delay on the mainline within the study limit would be about 12 min/veh. For the overall peak period, the average speed is about 51 km/h (32 mph). Similar to the No-Build Alternative, high demand causes the bottlenecks to occur at the tunnel and near several on-ramps east of the tunnel. Some of the ramps such as the northbound State Route 13 on-ramp would have long queues and delay.

Even though there will be no difference in the number of lanes open in the eastbound peak direction, a slight increase of forecast demand is generated thus leading to a slight degradation in operations versus the no-build alternative. However, the total delay, considering both eastbound and westbound trips, will still be much less for this alternative compared with the No-Build Alternative.

Table 2.1.5-7 Alternative 2N Eastbound p.m. Peak Period (2032)

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00
580 connector on-ramp to EB 24	3478	2443	2844	3950	62	16	19	38	D	F	F	F
580-980 connector to Claremont Ave off	6478	5443	5844	6950	63	19	21	32	C	F	F	F
Claremont Ave off to Telegraph on-ramp	5659	4407	4898	5896	65	11	13	17	C	F	F	F
Telegraph Ave on to Broadway off-ramp	5712	5636	5958	6212	57	16	19	22	F	F	F	F
Broadway off to on-ramp	5188	5058	5357	5592	35	13	15	17	F	F	F	F
Broadway on to SB SR 13 off-ramp	6117	6249	6357	6242	26	15	15	15	F	F	F	F
SB SR 13 off to NB SR 13 on-ramp	4837	4714	4910	4740	17	11	12	13	F	F	F	F
NB SR 13 on to Tunnel Rd off-ramp	6337	6214	6410	6240	15	12	13	14	F	F	F	F
Tunnel Rd off to Tunnel Rd on-ramp	6260	6109	6324	6160	20	18	21	21	F	F	F	F
Tunnel Rd on to Caldecott Tunnel	7600	7600	7044	7040	34	33	27	30	F	F	F	F
Tunnel to Fish Ranch Rd off-ramp	7600	7444	7044	7040	53	52	29	32	E	F	F	F
Fish Ranch Rd off to on-ramp	7576	7414	7022	7012	57	51	27	29	D	F	F	F
Fish Ranch Rd on to Gateway off-ramp	8006	7883	7543	7472	56	48	33	36	E	F	F	F
Gateway off to on-ramp	7989	7863	7523	7453	56	45	33	35	E	F	F	F
Gateway on to Orinda off-ramp	8009	7894	7553	7474	56	42	33	35	E	F	F	F
Orinda off to loop on-ramp	6597	6683	6367	6320	62	24	21	22	F	F	F	F
Orinda loop on to diagonal on-ramp	7607	7693	7516	7231	45	19	18	18	F	F	F	F
Orinda diagonal on to St Stephens off-ramp	8187	8282	8215	7803	31	23	22	21	F	F	F	F
St Stephens off to on-ramp	7944	7970	7844	7562	40	39	37	36	F	F	F	F
St Stephens on to Acalanes off-ramp	8315	8400	8284	7963	48	52	47	43	F	E	F	F
Acalanes off to on-ramp	7911	7843	7870	7526	40	46	39	35	F	E	F	F
Acalanes on to Oakhill off-ramp	8400	8373	8400	8016	52	52	52	44	E	E	E	F
Oakhill off to First St on-ramp	7947	7702	7887	7673	51	50	57	38	F	E	D	F
First St on to Pleasant Hill off-ramp	9517	9465	9467	9143	46	49	54	34	F	E	E	F
Pleasant Hill off to on-ramp	8400	8165	8392	8400	52	55	52	52	E	E	E	E
To SB 680-Mt Diablo Blvd off-ramp	9330	9255	9582	9370	56	56	53	56	D	D	E	D
To Ygnacio Valley off to NB 680 connector off	6411	6428	6716	6881	57	57	54	52	E	E	E	E

Alternative 2N Westbound a.m. Peak Period

Construction of the new bore would not provide additional capacity or added lane for westbound during a.m. peak. Yet continual demand growth is projected along the corridor, and the analysis result reflects this trend. The westbound State Route 24 corridor would be congested from I-680 to I-580 during the a.m. peak period. There would be two bottlenecks, one at the Caldecott Tunnel approach and the other at the westbound State Route 24 to I-580 connector. In this alternative, the Caldecott Tunnel approach remains as a primary bottleneck since the capacity of the four lanes remains the same as compared to the No-Build Alternative. An incremental increase in traffic demand is forecasted. This will cause congestion to extend from the Caldecott Tunnel approach to the I-680 junction. Similar increase in demand is also forecasted for the westbound State Route 24 to I-580 connector. This will cause congestion to extend from the connector to the mainline and eventually into the Caldecott Tunnel.

The analysis shows that overall average delay on the mainline within the study limit is about 38 min/veh. The maximum queue would extent through the corridor, from the I-580 junction to the I-680 junction, a distance of approximately 20.9 kilometers (13 miles). The average travel speed for the corridor is about 27 km/h (17 mph). Similar to the No-Build Alternative, ramp delays would also be due to the demand exceeding the capacity of the ramps. The delays on the on- and off-ramps would be similar to the No-Build Alternative as the demand is similar.

Even though there will be no difference in the number of lanes open in the westbound peak direction, a slight increase of forecast demand is generated thus leading to a slight degradation in operations versus the no-build alternative. However, the total delay, considering both eastbound and westbound trips, will still be much less for this alternative compared with the No-Build Alternative.

Table 2.1.5-8 Alternative 2N Westbound a.m. Peak Period (2032)

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00
SB 680 on	1285	1250	834	2144	18	3	2	5	F	F	F	F
NB 680 on to Pleasant Hill off-ramp	5095	5191	4745	5545	26	10	9	11	F	F	F	F
Pleasant Hill off to on ramp	3858	3844	3363	4284	22	8	6	9	F	F	F	F
Pleasant Hill on to Lafayette off-ramp	6158	6253	5742	6374	41	16	14	16	F	F	F	F
Lafayette off to on-ramp	4621	4774	4272	4898	36	11	9	12	F	F	F	F
Lafayette on to Bridge (5 lanes)	5551	5774	5243	5777	37	16	13	16	F	F	F	F
Bridge (5 lanes) to Acalanes off-ramp	5551	5774	5243	5777	28	11	9	11	F	F	F	F
Acalanes off to on-ramp	5284	5440	4907	5430	25	10	8	10	F	F	F	F
Acalanes on to St Stephens off-ramp	6005	6211	5688	6120	26	12	10	12	F	F	F	F
St Stephens off to on-ramp	5895	6073	5557	5992	23	12	10	11	F	F	F	F
St Stephens on to Camino Pablo off-ramp	6245	6462	5977	6371	24	15	13	14	F	F	F	F
Camino Pablo off to on-ramp	5137	5249	4827	5247	22	13	12	13	F	F	F	F
Camino Pablo on to Gateway off-ramp	7137	7249	6827	6900	29	21	18	18	F	F	F	F
Gateway off to on-ramp	7119	7089	6663	6880	42	27	23	25	F	F	F	F
Gateway on to Fish Ranch off-ramp	7139	7290	6862	6909	42	27	23	23	F	F	F	F
Fish Ranch Rd off to on-ramp	7058	7133	6701	6817	41	28	23	24	F	F	F	F
Fish Ranch Rd on to Caldecott Tunnel	7088	7175	6731	6847	39	26	22	23	F	F	F	F
Caldecott Tunnel to Caldecott Lane off-ramp	7088	7175	6731	6847	38	26	22	23	F	F	F	F
Caldecott Lane off to on-ramp	6979	7025	6542	6689	38	26	22	23	F	F	F	F
Caldecott Lane on to NB 13 off-ramp	7059	7146	6662	6769	32	20	17	18	F	F	F	F
NB 13 off to SB 13 off-ramp	6555	6592	6068	6353	32	22	18	20	F	F	F	F
SB 13 off to SR 13 on-ramp	5259	5167	4683	5003	23	13	11	12	F	F	F	F
SR 13 on to Broadway Off	6408	6317	5853	6013	25	17	14	14	F	F	F	F
Broadway off to College off-ramp	6008	5852	5448	5614	24	17	15	15	F	F	F	F
College off to Patton on-ramp	5676	5409	5063	5256	21	14	13	14	F	F	F	F
Patton on to Telegraph Ave off-ramp	5956	5729	5364	5485	22	16	14	15	F	F	F	F
Telegraph Ave off to Claremont Ave on-ramp	5063	4808	4398	4741	15	11	10	11	F	F	F	F
Claremont Ave on to WB 24 (3 lanes)	5863	5728	5318	5471	20	18	15	15	F	F	F	F
WB 24 to 580 connector	3560	3560	3560	3560	52	52	52	52	E	E	E	E

Alternative 2N Westbound p.m. Peak Period

Alternative 2N would add two additional lanes for westbound traffic during the p.m. peak. The analysis reveals that the traffic in the westbound State Route 24 would experience almost no congestion during the p.m. peak period since the bottleneck at the tunnel would be eliminated for the projected year 2032. However, there would be minor congestion at the westbound State Route 24 to I-580 connector because demand will exceed capacity at that location. The average travel speed would be about 101 km/h (63 mph). The overall average delay and congestion on the mainline within the study limit would be negligible. There would be ramp delays due to the demand exceeding capacity of the ramps, as mentioned previously.

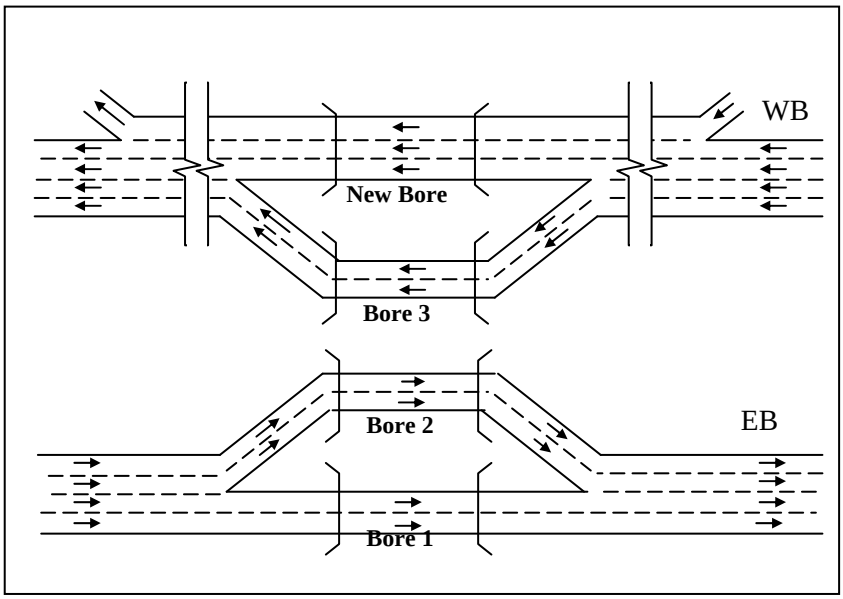
Table 2.1.5-9 Alternative 2N Westbound p.m. Peak Period (2032)

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00
SB 680 on	4890	4939	4860	4280	64	64	64	65	C	C	C	C
NB 680 on to Pleasant Hill off-ramp	8039	8220	8191	7080	62	62	62	65	C	D	D	C
Pleasant Hill off to on ramp	6629	6780	7001	6220	63	63	62	64	D	D	D	C
Pleasant Hill on to Lafayette off-ramp	7697	7841	8061	6900	64	64	63	65	C	C	C	C
Lafayette off to on-ramp	6197	6171	6291	5419	64	64	64	65	C	C	C	C
Lafayette on to Bridge (5 lanes)	6826	6882	6960	6048	63	63	62	65	D	D	D	C
Bridge (5 lanes) to Acalanes off-ramp	6826	6882	6960	6048	65	65	65	65	C	C	C	C
Acalanes off to on-ramp	6405	6472	6480	5719	65	65	65	65	C	C	C	B
Acalanes on to St Stephens off-ramp	6875	6992	6979	6169	65	65	65	65	C	C	C	C
St Stephens off to on-ramp	6655	6733	6719	5990	63	63	63	63	C	C	C	C
St Stephens on to Camino Pablo off-ramp	6814	6924	6909	6151	65	65	65	65	C	C	C	C
Camino Pablo off to on-ramp	5164	5183	5341	4781	65	65	65	65	C	C	C	C
Camino Pablo on to Gateway off-ramp	6345	6564	6592	5962	65	65	65	65	C	C	C	C
Gateway off to on-ramp	6145	5232	5153	5721	64	65	65	65	C	C	C	C
Gateway on to Fish Ranch off-ramp	6544	6362	6594	5960	65	65	65	65	C	C	C	C
Fish Ranch Rd off to on-ramp	6414	6091	6304	5830	60	60	60	60	D	C	D	C
Fish Ranch Rd on to Caldecott Tunnel	6475	6190	6394	5910	55	55	55	55	D	D	D	D
Caldecott Tunnel to Caldecott Lane off-ramp	6475	6190	6394	5910	60	60	60	60	D	C	D	C
Caldecott Lane off to on-ramp	6356	6040	6272	5800	64	65	64	65	C	C	C	C
Caldecott Lane on to NB 13 off-ramp	6486	6170	6412	5901	65	65	65	65	C	C	C	C
NB 13 off to SB 13 off-ramp	6137	5790	6053	5550	64	65	65	65	C	C	C	C
SB 13 off to SR 13 on-ramp	4397	3931	4293	3981	65	65	65	65	B	B	B	B
SR 13 on to Broadway Off	5267	4881	5194	4730	65	65	65	65	B	B	B	B
Broadway off to College off-ramp	4937	4502	4804	4389	65	65	65	65	C	B	C	B
College off to Patton on-ramp	4569	4090	4373	4059	65	65	65	65	B	B	B	B
Patton on to Telegraph Ave off-ramp	4878	4420	4703	4329	65	65	65	65	C	B	C	B
Telegraph Ave off to Claremont Ave on-ramp	4367	3849	4143	3829	65	65	65	65	B	B	B	B
Claremont Ave on to WB 24 (3 lanes)	5169	4853	5053	4619	45	44	64	65	F	D	C	B
WB 24 to 580 connector	3560	3393	3560	3150	52	56	52	60	E	D	E	D

Alternative 3N

Alternative 3N would be constructed north of the third bore and would provide three standard-width lanes. The outside lane would serve as an auxiliary lane between the Gateway Blvd. on-ramp and the northbound State Route 13 off-ramp. The two new inside lanes would transition to the right two lanes of the existing four-lane sections east and west of the tunnel (see Figure 2.1.5-10). With this alternative, four lanes would be open to eastbound traffic and five lanes would be open to westbound traffic at all times eliminating the need to switch the direction of flow in the middle bore, and thus increasing safety for both drivers and Department maintenance personnel.

Figure 2.1.5-10 Proposed Three-Lane Bore (simplified)



Alternative 3N Eastbound a.m. Peak Period

Similar to Alternative 2N, the analysis indicates that the eastbound State Route 24 traffic would experience no congestion during the a.m. peak period. The two new lanes would have enough capacity to eliminate the bottleneck at the tunnel. Motorists would be traveling at free-flow speed in the tunnel and along the corridor.

Table 2.1.5-10 Alternative 3N Eastbound a.m. Peak Period (2032)Alternative 3N Eastbound p.m. Peak Period

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00
580 connector on-ramp to EB 24	2639	2649	2741	2010	65	65	65	65	C	C	C	B
580-980 connector to Claremont Ave off	3260	3229	3351	2499	65	65	65	65	B	B	B	A
Claremont Ave off to Telegraph on-ramp	2390	2229	2311	1839	65	65	65	65	A	A	A	A
Telegraph Ave on to Broadway off-ramp	2760	2690	2781	2278	65	65	65	65	A	A	A	A
Broadway off to on-ramp	2410	2019	2101	2049	65	65	65	65	A	A	A	A
Broadway on to SB SR 13 off-ramp	2851	2528	2622	2419	65	65	65	65	A	A	A	A
SB SR 13 off to NB SR 13 on-ramp	2221	1527	1802	1709	65	65	65	65	A	A	A	A
NB SR 13 on to Tunnel Rd off-ramp	3721	3027	3302	3209	65	65	65	65	B	A	A	A
Tunnel Rd off to Tunnel Rd on-ramp	3675	2977	3247	3174	65	65	65	65	B	B	B	B
Tunnel Rd on to Caldecott Tunnel	4846	4477	4747	4674	65	65	65	65	C	B	C	B
Tunnel to Fish Ranch Rd off-ramp	4846	4477	4747	4674	55	55	55	55	C	C	C	C
Fish Ranch Rd off to on-ramp	4817	4428	4693	4633	65	65	65	65	C	B	C	B
Fish Ranch Rd on to Gateway off-ramp	4947	4629	4913	4753	65	65	65	65	C	B	C	C
Gateway off to on-ramp	4939	4612	4903	4742	65	65	65	65	C	B	C	C
Gateway on to Orinda off-ramp	4950	4632	4913	4753	65	65	65	65	C	B	C	C
Orinda off to loop on-ramp	4333	3963	4184	4053	65	65	65	65	B	B	B	B
Orinda loop on to diagonal on-ramp	5403	4974	5253	5083	65	65	65	65	B	B	B	B
Orinda diagonal on to St Stephens off-ramp	5832	5473	5733	5514	65	65	65	65	B	B	B	B
St Stephens off to on-ramp	5737	5360	5628	5449	65	65	65	65	C	C	C	C
St Stephens on to Acalanes off-ramp	5957	5630	5868	5628	65	65	65	65	C	C	C	C
Acalanes off to on-ramp	5586	5240	5460	5250	65	65	65	65	C	C	C	C
Acalanes on to Oakhill off-ramp	5976	5690	5940	5670	65	65	65	65	C	C	C	C
Oakhill off to First St on-ramp	5478	5139	5333	5113	65	65	65	65	C	C	C	C
First St on to Pleasant Hill off-ramp	6748	6439	6603	6373	65	65	65	65	C	C	C	C
Pleasant Hill off to on-ramp	6207	5847	5971	5804	64	65	65	65	C	C	C	C
To SB 680-Mt Diablo Blvd off-ramp	7287	7107	7151	6874	64	65	65	65	C	C	C	C
To Ygnacio Valley off to NB 680 connector off	4865	4740	3946	4167	64	64	65	65	C	C	C	C

Alternative 3N Eastbound p.m. Peak Period

Construction of the new bore would not provide additional capacity or traffic lane for the eastbound direction during the p.m. peak period. Yet higher demand is projected for Alternative 3N compared to Alternative 2N and the No-Build Alternative. The locations of bottlenecks are similar to the Alternative 2N, and the queue is over 14.5 kilometers (nine miles) long. The overall average mainline delay is about 12 min/veh and the average speed is about 51 km/h (32 mph).

Even though there will be no difference in the number of lanes open in the eastbound peak direction, a slight increase of forecast demand is generated thus leading to further degradation in operations versus the no-build alternative. However, the total delay, considering both eastbound and westbound trips, will still be much less for this alternative compared with the No-Build Alternative.

Table 2.1.5-11 Alternative 3N Eastbound p.m. Peak Period Alternative 3N (2032)

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00
580 connector on-ramp to EB 24	3544	2327	2855	3979	62	11	19	39	D	F	F	F
580-980 connector to Claremont Ave off	5532	5327	5855	6979	54	16	21	32	F	F	F	F
Claremont Ave off to Telegraph on-ramp	4808	4304	4933	5936	38	9	13	17	F	F	F	F
Telegraph Ave on to Broadway off-ramp	5629	5553	6002	6283	35	16	20	23	F	F	F	F
Broadway off to on-ramp	5110	4977	5413	5669	24	12	15	18	F	F	F	F
Broadway on to SB SR 13 off-ramp	6070	6198	6433	6338	21	15	16	15	F	F	F	F
SB SR 13 off to NB SR 13 on-ramp	4816	4703	5031	4868	15	11	13	13	F	F	F	F
NB SR 13 on to Tunnel Rd off-ramp	6316	6203	6531	6368	14	12	14	14	F	F	F	F
Tunnel Rd off to Tunnel Rd on-ramp	6239	6100	6447	6290	20	18	22	22	F	F	F	F
Tunnel Rd on to Caldecott Tunnel	7600	7600	7055	7178	34	33	28	32	F	F	F	F
Tunnel to Fish Ranch Rd off-ramp	7600	7600	7055	7156	53	53	31	34	E	E	F	F
Fish Ranch Rd off to on-ramp	7577	7571	7034	7129	57	57	28	31	D	D	F	F
Fish Ranch Rd on to Gateway off-ramp	8007	7864	7553	7587	56	54	34	37	E	F	F	F
Gateway off to on-ramp	7991	7844	7533	7568	56	51	33	37	E	F	F	F
Gateway on to Orinda off-ramp	8011	7875	7562	7588	56	47	33	37	E	F	F	F
Orinda off to loop on-ramp	6941	6696	6403	6440	62	30	21	23	D	F	F	F
Orinda loop on to diagonal on-ramp	7658	7696	7514	7339	59	20	18	18	F	F	F	F
Orinda diagonal on to St Stephens off-ramp	8199	8276	8194	7879	34	22	22	21	F	F	F	F
St Stephens off to on-ramp	7963	7970	7855	7640	41	39	38	37	F	F	F	F
St Stephens on to Acalanes off-ramp	8333	8400	8296	7956	49	52	47	43	F	E	F	F
Acalanes off to on-ramp	7940	7853	7889	7527	41	46	39	35	F	E	F	F
Acalanes on to Oakhill off-ramp	8400	8333	8400	8017	52	53	52	44	E	E	E	F
Oakhill off to First St on-ramp	7957	7674	7895	7682	52	50	57	39	F	E	D	F
First St on to Pleasant Hill off-ramp	9496	9404	9455	9131	46	48	54	34	F	E	E	F
Pleasant Hill off to on-ramp	8400	8119	8400	8400	52	55	52	52	E	E	E	E
To SB 680-Mt Diablo Blvd off-ramp	9300	9179	9560	9360	57	57	53	56	D	D	E	D
To Ygnacio Valley off to NB 680 connector off	6385	6348	6654	6833	58	58	55	53	E	E	E	E

Alternative 3N Westbound a.m. Peak Period

This alternative would provide a total of five lanes in the westbound direction: two lanes in the third bore and three lanes in the fourth bore. Higher demand is projected for Alternative 3N compared with Alternative 2N and the No-Build Alternative. Even with a higher capacity, the analysis indicated that westbound State Route 24 corridor would still be congested from I-680 to I-580 during the a.m. peak period.

There would be two primary bottlenecks, one at the Caldecott Tunnel approach and the other at the westbound State Route 24 to I-580 connector, the same locations as in the other alternatives. As the numbers of lanes on the connector from westbound State Route 24 to I-580 remain the same, the high demand would cause traffic to back up from the connector through the bottleneck at the Caldecott Tunnel approach to the I-680 on-ramps.

The overall average delay on the freeway within the study limit would be about 35 min/veh. The maximum queue would extend through the corridor from the I-580 junction to the I-680 junction, a distance of approximately 20.9 kilometers (13 miles). The average travel speed for the corridor is

about 29 km/h (18 mph). With the additional lane open for westbound traffic, there would be minor improvement compared with the No-Build and Alternative 2N. There would be ramp delays due to the demand exceeding capacity of the ramps as mentioned previously.

Table 2.1.5-12 Alternative 3N Westbound a.m. Peak Period (2032)

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00	6:00	7:00	8:00	9:00
SB 680 on	2391	3914	1215	2030	14	18	3	5	F	F	F	F
NB 680 on to Pleasant Hill off-ramp	6321	7297	5215	5511	24	24	10	11	F	F	F	F
Pleasant Hill off to on ramp	5133	6014	3917	4268	21	21	8	9	F	F	F	F
Pleasant Hill on to Lafayette off-ramp	7392	6863	6227	6328	38	23	16	15	F	F	F	F
Lafayette off to on-ramp	5904	5428	4801	4943	32	17	11	12	F	F	F	F
Lafayette on to Bridge (5 lanes)	6815	6014	5740	5804	38	20	16	17	F	F	F	F
Bridge (5 lanes) to Acalanes off-ramp	6815	6014	5740	5804	26	12	11	11	F	F	F	F
Acalanes off to on-ramp	6585	5696	5419	5502	23	11	10	10	F	F	F	F
Acalanes on to St Stephens off-ramp	7266	6435	6168	6172	24	14	12	12	F	F	F	F
St Stephens off to on-ramp	7150	6309	6049	6038	21	13	12	12	F	F	F	F
St Stephens on to Camino Pablo off-ramp	7490	6709	6459	6429	24	17	15	14	F	F	F	F
Camino Pablo off to on-ramp	6418	5535	5356	5357	23	16	14	14	F	F	F	F
Camino Pablo on to Gateway off-ramp	8417	7535	7237	6929	25	19	17	15	F	F	F	F
Gateway off to on-ramp	8400	7368	7068	6902	52	30	27	25	E	F	F	F
Gateway on to Fish Ranch off-ramp	8420	7569	7268	6931	63	18	17	15	D	F	F	F
Fish Ranch Rd off to on-ramp	7114	7413	7107	6840	51	17	16	15	F	F	F	F
Fish Ranch Rd on to Caldecott Tunnel	7143	7454	7136	6870	41	17	16	15	F	F	F	F
Caldecott Tunnel to Caldecott Lane off-ramp	7143	7454	7136	6870	36	17	16	15	F	F	F	F
Caldecott Lane off to on-ramp	7027	7297	6910	6691	31	17	15	14	F	F	F	F
Caldecott Lane on to NB 13 off-ramp	7107	7293	6935	6988	34	21	19	19	F	F	F	F
NB 13 off to SB 13 off-ramp	6588	6696	6289	6552	34	23	20	22	F	F	F	F
SB 13 off to SR 13 on-ramp	5228	5149	4836	5126	24	13	12	13	F	F	F	F
SR 13 on to Broadway Off	6378	6299	6007	6136	26	17	15	15	F	F	F	F
Broadway off to College off-ramp	5960	5808	5582	5736	25	17	15	16	F	F	F	F
College off to Patton on-ramp	5609	5303	5164	5352	22	14	13	14	F	F	F	F
Patton on to Telegraph Ave off-ramp	5889	5623	5464	5582	22	16	15	15	F	F	F	F
Telegraph Ave off to Claremont Ave on-ramp	4919	4651	4442	4794	15	11	10	11	F	F	F	F
Claremont Ave on to WB 24 (3 lanes)	5659	5571	5362	5474	18	17	15	15	F	F	F	F
WB 24 to 580 connector	3560	3560	3560	3560	52	52	52	52	E	E	E	E

Alternative 3N Westbound p.m. Peak Period

Alternative 3N would add three additional lanes for westbound traffic during the p.m. peak period. Traffic westbound on State Route 24 would experience almost no congestion during the p.m. peak period since the bottleneck at the Caldecott Tunnel approach would be eliminated. There would still be minor congestion at the westbound State Route 24 to I-580 connector due to the high demand at that location. The average traffic speed would be about 100 km/h (62 mph). The overall congestion on the mainline within the study limit would be negligible. There would be ramp delays due to the demand exceeding capacity of the ramps as mentioned previously.

Table 2.1.5-13 Alternative 3N Westbound p.m. Peak Period (2032)

	Throughput Volume (vehicle)				Speed (mph)				Level of Service			
Sub Section Location	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00	15:00	16:00	17:00	18:00
SB 680 on	4971	5020	4941	4349	63	63	64	65	D	D	C	C
NB 680 on to Pleasant Hill off-ramp	8222	8418	8380	7250	62	61	61	65	D	D	D	C
Pleasant Hill off to on ramp	6842	7008	7210	6410	63	62	61	64	D	D	D	C
Pleasant Hill on to Lafayette off-ramp	7871	8058	8237	7070	64	63	63	65	C	C	D	C
Lafayette off to on-ramp	6381	6418	6508	5611	64	64	64	65	C	C	C	C
Lafayette on to Bridge (5 lanes)	6990	7098	7146	6220	62	62	61	64	D	D	D	C
Bridge (5 lanes) to Acalanes off-ramp	6990	7098	7146	6220	65	65	65	65	C	C	C	C
Acalanes off to on-ramp	6579	6698	6676	5960	65	65	65	65	C	C	C	C
Acalanes on to St Stephens off-ramp	7029	7179	7147	6400	65	65	65	65	C	C	C	C
St Stephens off to on-ramp	6829	6959	6928	6239	63	63	63	63	C	C	C	C
St Stephens on to Camino Pablo off-ramp	6990	7148	7119	6400	65	65	65	65	C	C	C	C
Camino Pablo off to on-ramp	5370	5448	5579	5141	65	65	65	65	C	C	C	C
Camino Pablo on to Gateway off-ramp	6519	6797	6799	6212	65	65	65	65	C	C	C	C
Gateway off to on-ramp	6320	5468	5359	5973	64	65	65	65	C	C	C	C
Gateway on to Fish Ranch off-ramp	6720	6598	6799	6213	65	65	65	65	C	C	C	C
Fish Ranch Rd off to on-ramp	6590	6328	6510	6082	60	60	60	60	C	C	C	C
Fish Ranch Rd on to Caldecott Tunnel	6651	6428	6600	6162	55	55	55	55	C	C	C	C
Caldecott Tunnel to Caldecott Lane off-ramp	6651	6428	6600	6162	60	60	60	60	C	C	C	C
Caldecott Lane off to on-ramp	6521	6288	6491	6042	65	65	65	65	C	C	C	C
Caldecott Lane on to NB 13 off-ramp	6651	6418	6631	6142	65	65	65	65	C	C	C	C
NB 13 off to SB 13 off-ramp	6251	6019	6259	5772	64	65	64	65	C	C	C	C
SB 13 off to SR 13 on-ramp	4411	4059	4390	4191	65	65	65	65	B	B	B	B
SR 13 on to Broadway Off	5330	5028	5321	4942	65	65	65	65	B	B	B	B
Broadway off to College off-ramp	4978	4629	4910	4562	65	65	65	65	C	B	C	B
College off to Patton on-ramp	4587	4239	4511	4202	65	65	65	65	B	B	B	B
Patton on to Telegraph Ave off-ramp	4897	4568	4841	4472	65	65	65	65	C	B	C	B
Telegraph Ave off to Claremont Ave on-ramp	4359	3968	4271	3942	65	65	65	65	B	B	B	B
Claremont Ave on to WB 24 (3 lanes)	5241	4956	5100	4855	52	52	39	38	F	C	F	D
WB 24 to 580 connector	3560	3497	3560	3383	52	54	52	56	E	D	E	D

The No-Build, Alternative 2N and Alternative 3N operations for both eastbound and westbound a.m. and p.m. peak periods are summarized below in Tables 2.1.5-14 and 2.1.5-15.

Table 2.1.5-14 Eastbound SR-24 Operation Summary

	Starting Hour	Estimated Queue in Corridor (mile)	Total Travel Distance (veh-mile)	Weighted Average Speed (mph)	Total Mainline Delay (veh-hour)	Ramp Delay (veh-hr)	Weighted Average Mainline Delay (min/veh)	Freeway Travel Time (min)
EB 24 A.M. No Build	6:00 A.M.	2	52,806	41	436	125	12	23
	7:00 A.M.	2	53,019	27	1,103	729	44	56
	8:00 A.M.	4	51,744	20	1,707	1,389	69	81
	9:00 A.M.	4	47,941	15	2,521	1,964	111	122
	4-hr Average			23			78	
EB 24 A.M. 2-Lane Bore	6:00 A.M.	0	63,190	64	0	176	0	12
	7:00 A.M.	0	59,016	64	0	786	0	12
	8:00 A.M.	0	61,672	64	0	1,436	0	12
	9:00 A.M.	0	59,037	64	0	1,671	0	12
	4-hr Average			64	0		0	
EB 24 A.M. 3-Lane Bore	6:00 A.M.	0	63,373	64	0	175	0	12
	7:00 A.M.	0	59,366	64	0	795	0	12
	8:00 A.M.	0	61,772	64	0	1,435	0	12
	9:00 A.M.	0	58,639	64	0	1,660	0	12
	4-hr Average			64			0	
EB 24 P.M. No-Build	3:00 P.M.	5	97,251	50	173	575	1	15
	4:00 P.M.	5	96,928	37	775	2,691	8	22
	5:00 P.M.	9	97,504	31	1,194	5,393	12	26
	6:00 P.M.	11	95,096	28	1,563	5,885	14	29
	4-hr Average			35			11	
EB 24 P.M. 2-Lane Bore	3:00 P.M.	6	98,293	43	449	743	4	19
	4:00 P.M.	8	95,527	30	1,277	3,204	13	28
	5:00 P.M.	9	96,138	30	1,381	5,890	13	28
	6:00 P.M.	11	97,141	30	1,364	5,987	13	27
	4-hr Average			32			12	
EB 24 P.M. 3-Lane Bore	3:00 P.M.	7	98,181	41	552	779	5	20
	4:00 P.M.	7	94,929	30	1,300	3,374	14	29
	5:00 P.M.	9	96,549	30	1,336	6,224	13	27
	6:00 P.M.	11	97,845	30	1,300	6,383	12	27
	4-hr Average			32			12	

Table 2.1.5-15 Westbound SR-24 Operation Summary

	Starting Hour	Estimated Queue in Corridor (mile)	Total Travel Distance (veh-mile)	Weighted Average Speed (mph)	Total Mainline Delay (veh-hour)	Ramp Delay (veh-hr)	Weighted Average Mainline Delay (min/veh)	Freeway Travel Time (min)
WB 24 A.M. No Build	6:00 A.M.	13	96,690	30	1,348	2,041	14	27
	7:00 A.M.	13	78,846	16	3,320	4,515	35	51
	8:00 A.M.	13	78,072	16	3,423	4,863	36	51
	9:00 A.M.	13	73,157	14	3,908	4,396	43	59
	4-hr Average			18			35	
WB 24 A.M. 2-Lane Bore	6:00 A.M.	13	95,437	28	1,454	2,453	16	28
	7:00 A.M.	13	78,366	16	3,387	5,212	37	52
	8:00 A.M.	13	72,411	14	3,920	5,653	47	63
	9:00 A.M.	13	77,177	15	3,568	4,647	37	53
	4-hr Average			17			38	
WB 24 A.M. 3-Lane Bore	6:00 A.M.	13	96,402	28	1,581	1,890	15	29
	7:00 A.M.	13	86,245	18	3,083	3,413	29	44
	8:00 A.M.	13	77,342	14	3,874	4,324	42	57
	9:00 A.M.	13	77,733	14	3,905	4,677	40	56
	4-hr Average			18			35	
WB 24 P.M. No-Build	3:00 P.M.	4	70,912	36	736	75	10	23
	4:00 P.M.	8	67,383	20	2,086	380	26	40
	5:00 P.M.	8	64,725	16	2,855	1,380	33	48
	6:00 P.M.	8	59,021	13	3,382	2,034	43	58
	4-hr Average			19			33	
WB 24 P.M. 2-Lane Bore	3:00 P.M.	0	82,519	62	11	195	0	13
	4:00 P.M.	0	81,379	62	12	775	0	13
	5:00 P.M.	0	83,180	63	0	1,459	0	12
	6:00 P.M.	0	74,305	64	0	1,718	0	12
	4-hr Average			63			0	
WB 24 P.M. 3-Lane Bore	3:00 P.M.	0	84,428	62	0	230	0	13
	4:00 P.M.	0	84,084	62	0	860	0	13
	5:00 P.M.	0	85,579	61	28	1,579	0	13
	6:00 P.M.	0	77,034	61	28	1,798	0	13
	4-hr Average			62			0	

Intersection Analysis

To determine whether the proposed project would create traffic impacts beyond the immediate vicinity of the Caldecott Tunnel and in response to stakeholder requests for such analyses, an intersection analysis was conducted. A number of intersections were examined in addition to studying the freeway performance of the proposal. Along with ramp intersections, local intersections in the cities of Oakland and Berkeley in Alameda County as well as Orinda, Lafayette, and Walnut Creek in Contra Costa County were included. In order to evaluate the performance of the intersections, Synchro Trafficware was selected for the intersection analysis. The software is capable of analyzing both unsignalized and signalized intersections and also allows optimization of traffic signal timing.

The Year 2000 edition of the Highway Capacity Manual defined six levels of service (LOS) for intersections. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions. For the purposes of determining LOS at a signalized intersection, average control delay is considered. Control delay involves movements at slower speeds and stops on intersection approaches, as vehicle move up in the queue or slow down upstream of the intersection. LOS for an unsignalized intersection is based on the control delay experienced and is not defined for the intersection as a whole. Table 2.1.5-16 summarizes the average range of control delay experienced by motorists traversing both signalized and unsignalized intersections for each of the service levels.

Table 2.1.5-16 Intersection Level of Service Criteria

Level of Service	Control Delay for Signalized Intersections (Seconds/Vehicle)	Control Delay for Unsignalized Intersections (Seconds/Vehicle)
A	0-10	0-10
B	>10-20	>10-15
C	>20-35	>15-25
D	>35-55	>25-35
E	>55-80	>35-50
F	>80	>50

Intersection Existing Condition

Intersection traffic counts were conducted as part of the scoping and screening process in preparation for selecting alternatives. Based upon previous review of the intersections being considered, 31 key intersections were identified for LOS analyses. Table 2.1.5-17 shows the results, which are based on movement volume counts conducted in 2002. As part of the analyses, *Synchro* applied signal optimization to determine the LOS. The intent of applying signal optimization is to reduce overall intersection delay and allow uniform comparison between the existing condition and the future condition.

Table 2.1.5-17 Existing Intersection LOS

			Existing Conditions			
			A.M. Peak Hour Analyses		P.M. Peak Hour Analyses	
	Intersection	Intersection Control	LOS	Avg Delay (Sec)	LOS	Avg Delay (Sec)
	City of Oakland					
OAK-1	MLK & 47th Street	Signalized	A	6	B	10
OAK-2	Telegraph Ave & SR 24 WB Off-Ramp/Aileen St	Signalized	B	18	A	9
OAK-3	Telegraph Ave & SR 24 EB On-Ramp/56th St	Signalized	A	4	C	30
OAK-4	Claremont Ave & SR 24 WB On-Ramp	Signalized	A	2	A	3
OAK-5	College Ave & Keith Ave	Signalized	A	5	A	8
OAK-6	College Ave & Miles Ave	Signalized	A	8	A	6
OAK-7	College Ave & Claremont Ave	Signalized	C	31	D	49
OAK-8	Broadway & SR 24 EB On-Ramp	Unsignalized	A	10	B	13
OAK-9	Tunnel Road (Landvale) & Caldecott Ln	Signalized	E	60	A	8
OAK-10	Caldecott Ln & SR 24 WB Ramps	Unsignalized	B	12	B	10
OAK-11	Broadway Terr & SR 13 NB On-Ramp	Unsignalized	F	97	C	23
	City of Berkeley					
BERK-1	College Ave & Ashby Ave	Signalized	B	11	C	30
BERK-2	Ashby Ave & Claremont Ave	Signalized	B	15	C	22
BERK-3	Tunnel Road & Domingo Ave	Signalized	B	15	B	11
	City of Orinda					
ORIN-1	Camino Pablo & Orinda Way	Signalized	A	6	B	11
ORIN-2	Camino Pablo & SR 24 WB On-Ramp/Santa Maria Way	Signalized	A	5	B	12
ORIN-3	Camino Pablo & SR 24 EB Off-Ramp/Brookwood Rd	Signalized	E	57	E	62
ORIN-4	St Stephens Dr & SR 24 WB Ramps	Unsignalized	A	10	B	10
ORIN-5	St Stephens Dr & SR 24 EB Off-Ramp/Wanda Ln	Unsignalized	A	9	A	9
	City of Lafayette					
LFYT-1	Acalanes Rd & SR 24 EB Ramps/Mt Diablo Blvd	Signalized	A	7	A	7
LFYT-2	El Nido Ranch Rd & SR 24 WB Ramps	Unsignalized	A	9	A	8
LFYT-3	Deer Hill Rd & SR 24 WB Ramps	Signalized	B	11	B	14
LFYT-4	First St & SR 24 EB On-Ramp	Uncontrolled	A	9	B	11
LFYT-5	Oak Hill Rd & SR 24 EB Off-Ramp	Unsignalized	B	13	C	17
LFYT-6	Mt Diablo Blvd & Oak Hill Rd	Signalized	A	7	A	9
LFYT-7	Mt Diablo Blvd & Moraga Rd	Signalized	B	15	D	43
LFYT-8	Mt Diablo Blvd & First St	Signalized	B	17	B	12
LFYT-9	Pleasant Hill Rd & Stanley Blvd/Deer Hill Rd	Signalized	C	28	B	16
LFYT-10	Pleasant Hill Rd & SR 24 EB On-Ramp/Mt Diablo Blvd	Signalized	A	7	A	8
LFYT-11	Pleasant Hill Rd & SR 24 EB Off-Ramp/Old Tunnel Rd	Signalized	A	7	A	7
	City of Walnut Creek					
WLCK-1	Ygnacio Valley Rd & Oakland Blvd/EB Off-Ramp	Signalized	B	11	A	9

Intersection Future Condition

Based on future demand forecasts, a number of intersections within the study area would experience high growth in demand even in the No-Build Alternative. Compared to the No-Build Alternative, Alternative 2N would experience incremental demand growth. Alternative 3N would only cause marginal demand increase compared to Alternative 2N. The intersection LOS analysis reflects this demand growth trend. Tables 2.1.5-18, 2.1.5-19 and 2.1.5-20 show the analyses results for the No-Build Alternative, Alternative 2N and Alternative 3N.

The results indicate that both Build alternatives would lead to changes of LOS at individual intersections compared to No-Build alternative, reflecting the incremental demand changes in the forecast network. However, from an overall project level, the results indicate that neither build alternatives would cause significant negative impact compared to the No-Build Alternative.

Table 2.1.5-18 Year 2032 No-Build Intersection LOS

			Year 2032 No Build			
			A.M. Peak Hour Analyses		P.M. Peak Hour Analyses	
	Intersection	Intersection Control	LOS	Avg Delay (Sec)	LOS	Avg Delay (Sec)
	City of Oakland					
OAK-1	MLK & 47th Street	Signalized	A	9	A	8
OAK-2	Telegraph Ave & SR 24 WB Off-Ramp/Aileen St	Signalized	E	69	D	47
OAK-3	Telegraph Ave & SR 24 EB On-Ramp/56th St	Signalized	E	62	D	44
OAK-4	Claremont Ave & SR 24 WB On-Ramp	Signalized	A	5	A	7
OAK-5	College Ave & Keith Ave	Signalized	A	6	A	10
OAK-6	College Ave & Miles Ave	Signalized	A	9	A	10
OAK-7	College Ave & Claremont Ave	Signalized	E	61	E	62
OAK-8	Broadway & SR 24 EB On-Ramp	Unsignalized	A	10	F	82
OAK-9	Tunnel Road (Landvale) & Caldecott Ln	Signalized	D	41	B	12
OAK-10	Caldecott Ln & SR 24 WB Ramps	Unsignalized	C	18	B	14
OAK-11	Broadway Terr & SR 13 NB On-Ramp	Unsignalized	F	238	F	195
	City of Berkeley					
BERK-1	College Ave & Ashby Ave	Signalized	C	30	E	55
BERK-2	Ashby Ave & Claremont Ave	Signalized	F	352	F	222
BERK-3	Tunnel Road & Domingo Ave	Signalized	A	9	B	15
	City of Orinda					
ORIN-1	Camino Pablo & Orinda Way	Signalized	B	12	A	9
ORIN-2	Camino Pablo & SR 24 WB On-Ramp/Santa Maria Way	Signalized	A	7	A	10
ORIN-3	Camino Pablo & SR 24 EB Off-Ramp/Brookwood Rd	Signalized	E	73	F	174
ORIN-4	St Stephens Dr & SR 24 WB Ramps	Unsignalized	B	11	C	21
ORIN-5	St Stephens Dr & SR 24 EB Off-Ramp/Wanda Ln	Unsignalized	A	9	B	14
	City of Lafayette					
LFYT-1	Acalanes Rd & SR 24 EB Ramps/Mt Diablo Blvd	Signalized	A	7	A	10
LFYT-2	El Nido Ranch Rd & SR 24 WB Ramps	Unsignalized	F	355	D	29
LFYT-3	Deer Hill Rd & SR 24 WB Ramps	Signalized	C	29	E	70
LFYT-4	First St & SR 24 EB On-Ramp	Uncontrolled	B	11	B	14
LFYT-5	Oak Hill Rd & SR 24 EB Off-Ramp	Unsignalized	B	14	F	78
LFYT-6	Mt Diablo Blvd & Oak Hill Rd	Signalized	A	7	B	14
LFYT-7	Mt Diablo Blvd & Moraga Rd	Signalized	D	54	F	108
LFYT-8	Mt Diablo Blvd & First St	Signalized	E	67	E	61
LFYT-9	Pleasant Hill Rd & Stanley Blvd/Deer Hill Rd	Signalized	F	178	F	142
LFYT-10	Pleasant Hill Rd & SR 24 EB On-Ramp/Mt Diablo Blvd	Signalized	E	58	E	73
LFYT-11	Pleasant Hill Rd & SR 24 EB Off-Ramp/Old Tunnel Rd	Signalized	B	20	D	44
	City of Walnut Creek					
WLCK-1	Ygnacio Valley Rd & Oakland Blvd/EB Off-Ramp	Signalized	C	34	F	124

Table 2.1.5-19 Year 2032 Alternative 2N Intersection LOS

			Year 2032 2-Lane Bore			
			A.M. Peak Hour Analyses		P.M. Peak Hour Analyses	
	Intersection	Intersection Control	LOS	Avg Delay (Sec)	LOS	Avg Delay (Sec)
	City of Oakland					
OAK-1	MLK & 47th Street	Signalized	A	9	A	8
OAK-2	Telegraph Ave & SR 24 WB Off-Ramp/Aileen St	Signalized	E	69	D	47
OAK-3	Telegraph Ave & SR 24 EB On-Ramp/56th St	Signalized	E	62	D	44
OAK-4	Claremont Ave & SR 24 WB On-Ramp	Signalized	A	5	A	10
OAK-5	College Ave & Keith Ave	Signalized	A	7	A	9
OAK-6	College Ave & Miles Ave	Signalized	B	11	B	11
OAK-7	College Ave & Claremont Ave	Signalized	E	61	E	62
OAK-8	Broadway & SR 24 EB On-Ramp	Unsignalized	A	10	F	85
OAK-9	Tunnel Road (Landvale) & Caldecott Ln	Signalized	D	53	C	22
OAK-10	Caldecott Ln & SR 24 WB Ramps	Unsignalized	C	20	B	13
OAK-11	Broadway Terr & SR 13 NB On-Ramp	Unsignalized	F	245	F	343
	City of Berkeley					
BERK-1	College Ave & Ashby Ave	Signalized	E	57	E	69
BERK-2	Ashby Ave & Claremont Ave	Signalized	F	355	F	242
BERK-3	Tunnel Road & Domingo Ave	Signalized	A	9	B	15
	City of Orinda					
ORIN-1	Camino Pablo & Orinda Way	Signalized	A	10	B	11
ORIN-2	Camino Pablo & SR 24 WB On-Ramp/Santa Maria Way	Signalized	A	5	B	13
ORIN-3	Camino Pablo & SR 24 EB Off-Ramp/Brookwood Rd	Signalized	E	73	F	174
ORIN-4	St Stephens Dr & SR 24 WB Ramps	Unsignalized	B	11	C	18
ORIN-5	St Stephens Dr & SR 24 EB Off-Ramp/Wanda Ln	Unsignalized	A	9	C	16
	City of Lafayette					
LFYT-1	Acalanes Rd & SR 24 EB Ramps/Mt Diablo Blvd	Signalized	A	7	A	10
LFYT-2	El Nido Ranch Rd & SR 24 WB Ramps	Unsignalized	F	372	D	34
LFYT-3	Deer Hill Rd & SR 24 WB Ramps	Signalized	D	40	F	88
LFYT-4	First St & SR 24 EB On-Ramp	Uncontrolled	B	11	B	11
LFYT-5	Oak Hill Rd & SR 24 EB Off-Ramp	Unsignalized	B	14	F	158
LFYT-6	Mt Diablo Blvd & Oak Hill Rd	Signalized	A	7	C	22
LFYT-7	Mt Diablo Blvd & Moraga Rd	Signalized	E	56	F	101
LFYT-8	Mt Diablo Blvd & First St	Signalized	E	67	F	88
LFYT-9	Pleasant Hill Rd & Stanley Blvd/Deer Hill Rd	Signalized	F	156	F	173
LFYT-10	Pleasant Hill Rd & SR 24 EB On-Ramp/Mt Diablo Blvd	Signalized	E	60	F	107
LFYT-11	Pleasant Hill Rd & SR 24 EB Off-Ramp/Old Tunnel Rd	Signalized	B	19	D	48
	City of Walnut Creek					
WLCK-1	Ygnacio Valley Rd & Oakland Blvd/EB Off-Ramp	Signalized	C	33	F	140

Table 2.1.5-20 Year 2032 Alternative 3N Intersection LOS

			Year 2032 3-Lane Bore			
			A.M. Peak Hour Analyses		P.M. Peak Hour Analyses	
	Intersection	Intersection Control	LOS	Avg Delay (Sec)	LOS	Avg Delay (Sec)
	City of Oakland					
OAK-1	MLK & 47th Street	Signalized	A	9	A	8
OAK-2	Telegraph Ave & SR 24 WB Off-Ramp/Aileen St	Signalized	E	69	D	47
OAK-3	Telegraph Ave & SR 24 EB On-Ramp/56th St	Signalized	E	62	D	44
OAK-4	Claremont Ave & SR 24 WB On-Ramp	Signalized	A	5	B	11
OAK-5	College Ave & Keith Ave	Signalized	A	7	A	9
OAK-6	College Ave & Miles Ave	Signalized	B	11	A	10
OAK-7	College Ave & Claremont Ave	Signalized	E	61	E	62
OAK-8	Broadway & SR 24 EB On-Ramp	Unsignalized	A	10	F	108
OAK-9	Tunnel Road (Landvale) & Caldecott Ln	Signalized	D	52	B	15
OAK-10	Caldecott Ln & SR 24 WB Ramps	Unsignalized	C	16	B	15
OAK-11	Broadway Terr & SR 13 NB On-Ramp	Unsignalized	F	231	F	274
	City of Berkeley					
BERK-1	College Ave & Ashby Ave	Signalized	D	46	E	66
BERK-2	Ashby Ave & Claremont Ave	Signalized	F	356	F	235
BERK-3	Tunnel Road & Domingo Ave	Signalized	A	9	B	15
	City of Orinda					
ORIN-1	Camino Pablo & Orinda Way	Signalized	A	10	B	11
ORIN-2	Camino Pablo & SR 24 WB On-Ramp/Santa Maria Way	Signalized	B	14	B	14
ORIN-3	Camino Pablo & SR 24 EB Off-Ramp/Brookwood Rd	Signalized	E	73	F	174
ORIN-4	St Stephens Dr & SR 24 WB Ramps	Unsignalized	B	11	C	18
ORIN-5	St Stephens Dr & SR 24 EB Off-Ramp/Wanda Ln	Unsignalized	A	9	C	15
	City of Lafayette					
LFYT-1	Acalanes Rd & SR 24 EB Ramps/Mt Diablo Blvd	Signalized	A	7	A	10
LFYT-2	El Nido Ranch Rd & SR 24 WB Ramps	Unsignalized	F	115	E	37
LFYT-3	Deer Hill Rd & SR 24 WB Ramps	Signalized	D	50	F	95
LFYT-4	First St & SR 24 EB On-Ramp	Uncontrolled	B	12	B	11
LFYT-5	Oak Hill Rd & SR 24 EB Off-Ramp	Unsignalized	C	15	F	163
LFYT-6	Mt Diablo Blvd & Oak Hill Rd	Signalized	A	9	C	34
LFYT-7	Mt Diablo Blvd & Moraga Rd	Signalized	E	62	F	101
LFYT-8	Mt Diablo Blvd & First St	Signalized	E	70	F	94
LFYT-9	Pleasant Hill Rd & Stanley Blvd/Deer Hill Rd	Signalized	F	156	F	162
LFYT-10	Pleasant Hill Rd & SR 24 EB On-Ramp/Mt Diablo Blvd	Signalized	D	47	F	115
LFYT-11	Pleasant Hill Rd & SR 24 EB Off-Ramp/Old Tunnel Rd	Signalized	B	19	D	54
	City of Walnut Creek					
WLCK-1	Ygnacio Valley Rd & Oakland Blvd/EB Off-Ramp	Signalized	D	39	F	126

Weekends

The Operational Analysis Report utilized the weekday peak period forecast that was derived from the CCTA travel demand model. Weekend information was not available as part of the forecast model. However, it is reasonable to project that the benefit of both build alternatives during the weekday off-peak direction would extend to the weekend operations. The distribution and pattern of existing weekend traffic volumes at the Caldecott Tunnel are substantially different than weekdays. Saturdays generally experience higher volumes but in a similar pattern as Sundays. Unlike weekdays, weekends typically experience only one extended peak period around midday. In the westbound direction, the weekend traffic volumes typically peak before noon and remain level until gradually decreasing toward the evening. The eastbound traffic volumes typically peak in the afternoon and follow the same trend into the evening. This reflects a weekend travel pattern with most trips generated from Contra Costa County to Alameda County with returning trips occurring later during the day. Existing delays experienced during typical weekends are generally comparable to weekday off-peak period delays.

The study indicated that both build alternatives are expected to provide free flow travel during the weekday off-peak periods. If the future weekend traffic growth follows the weekday off-peak growth trend, then it is reasonable to expect weekend operations could experience similar benefits as weekday off-peak periods.

Northbound State Route 13 to Eastbound State Route 24 Operations

The Operations Analysis Report focused on the operations of State Route 24; northbound State Route 13 was not included in the study limits. However, both build alternatives are expected to provide free-flow travel in the weekday off-peak directions, and northbound State Route 13 could experience improved traffic operations as a result.

In the No-Build Alternative, only the first bore would be open to the eastbound traffic during the a.m. peak period. The merge from four lanes into two lanes would remain as the controlling bottleneck at the tunnel approach near the State Route 13 on-ramp. As with existing conditions, traffic on the northbound State Route 13 to eastbound State Route 24 connector would be congested due to the bottleneck at the eastbound tunnel approach. The existing queue that extends back to the mainline lanes on State Route 13 could be exacerbated with the growth of traffic demand.

With both build alternatives expected to provide free flow travel in the off-peak direction, the eastbound a.m. constraint at the tunnel approach would be removed. As a result, traffic flow at the northbound State Route 13 to eastbound State Route 24 connector could be improved, benefiting the northbound State Route 13 users.

2.1.5.3 AVOIDANCE, MINIMIZATION AND/OR MITIGATION MEASURES

The construction of either of the build alternatives would provide positive impacts, i.e., reduce congestion and increase safety. In addition, neither of the build alternatives would result in any substantial impacts to the local intersections studied compared to the No-Build Alternative. Therefore, no minimization or mitigation measures are recommended.

A Transportation Management Plan (TMP) will be prepared to address traffic delays during construction. Preparation of the TMP will be coordinated with local partners to develop the necessary strategies to raise awareness and reduce traffic impacts. The Department will minimize traffic impacts during construction for events such as the California Shakespeare Theater, located on the north side of State Route 24 at the Gateway Interchange during its continuous operation from May to October of every year Should the operation of the California Shakespeare Theater change, the Department will work closely with the theater to minimize any traffic impacts during construction.

2.1.6 Visual/Aesthetics

The *Visual Impact Assessment* (CirclePoint, June 2005) for the Caldecott Improvement Project was conducted in accordance with guidelines provided in the *FHWA Approach to Visual Assessment of Highway Projects* (FHWA, 1986). In addition, the Department's Office of Landscape Architecture prepared the *Visual Impact Assessment Addendum* in September 2005. The visual analysis characterizes the project area in terms of "landscape units," which are distinct segments of the corridor that have a consistent or cohesive visual or physical character, and identifies visual quality, prominent features, and scenic resources within the landscape units. Selected viewpoints along the State Route 24 scenic highway where the project could affect existing visual quality are identified and evaluated. In addition, physical changes attributable to the proposed project that would cause changes to views currently experienced by residents, motorists, and other users of the area are evaluated. Avoidance, minimization and compensation measures to address visual effects are described in Section 2.1.6.5.

2.1.6.1 REGULATORY SETTING

The National Environmental Policy Act of 1969 as amended (NEPA) establishes that the federal government uses all practicable means to ensure all Americans safe, healthful, productive, and *aesthetically* (emphasis added) and culturally pleasing surroundings [42 U.S.C. 4331(b)(2)]. To further emphasize this point, the FHWA in its implementation of NEPA [23 U.S. C. 109(h)] directs that final decisions regarding projects are to be made in the best overall public interest, taking into account adverse environmental impacts, including among others, the destruction or disruption of aesthetic values.

Likewise, the California Environmental Quality Act (CEQA) establishes that it is the policy of the state to take all action necessary to provide the people of the state "with…enjoyment of aesthetic, natural, scenic and historic environmental qualities." [CA Public Resources Code Section 21001(b)]

2.1.6.2 AFFECTED ENVIRONMENT

The existing visual conditions in the project area consist of visual resources (described in terms of visual character and quality), the characteristics of viewers, namely viewer exposure (the ability to see the project area), and viewer sensitivity.

Existing Visual Character and Context

The visual character of the San Francisco Bay region is a composite of urban and suburban development within and around mountains, open space and water. The Caldecott Tunnel is located at the base of the Berkeley Hills, which separate the metropolitan centers of Oakland and Berkeley from the more suburban and rural areas of Contra Costa County. Above and to the east of the Caldecott Tunnel are large areas of open space that make this area popular for recreational users, including bicyclists and hikers.

Motorists traveling within the corridor have a wide variety of visual experiences. When traveling eastbound on State Route 24 from Oakland, it is evident that the viewer is leaving the urban environment of Oakland and the inner Bay Area, and entering a more suburban and rural setting in Contra Costa County. This view transition is gradual, however, as the corridor provides a progression of visual character from the developed, urban areas of North Oakland and South Berkeley to the more densely vegetated and sparsely developed areas of the Oakland Hills. Motorists enter the existing bores, which are lit from inside, and exit the tunnel in a rural, woodsy area from a point at which the

only man-made development visible is the roadway itself, among densely vegetated patches of woodland and graded hillsides.

Motorists approaching the tunnel in the westbound direction on State Route 24 travel through the suburban and rural landscape of the Contra Costa communities of Lafayette and Orinda. Approaching the Caldecott Tunnel, the area becomes characterized by dense vegetation and steep hillsides along State Route 24. Much of this area is within the Sibley Volcanic Regional Preserve. At the tunnel portals, some man-made elements other than the highway become visible such as access roads and the tunnel portals. The portals are historic in character, as two of the existing three portals were constructed in 1937 and exhibit a unique Art Deco architectural character. Upon exiting the tunnel through the westbound portal, it is apparent that the motorist is leaving a rural, rolling hillside setting and entering a more urbanized and developed area. After traveling 0.8 kilometer (0.5 mile) from the westbound tunnel portal, motorists have views of Downtown Oakland, and in the distance, San Francisco, the San Francisco Bay, and the Oakland Bay Bridge. The panoramic view of the inner Bay Area is framed by dense residential development on both sides of State Route 24, and patches of mature trees that dot the surrounding hills.

Existing Visual Image Types and Viewer Groups

For the purposes of the visual impact assessment, the study area was subdivided into two landscape units that encompass distinct spatial areas. Each landscape unit has a distinct visual character based upon the land uses and features that comprise it. These smaller scale land uses or features within each landscape unit are called "image types." Five image types are located within the project area: wooded hillsides, graded hillsides, tunnel entrance, hillside residential, and hillside access roads.

"Viewer groups" are groups of people who regularly travel through the project area, or who have a certain degree of sensitivity to changes in the visual environment. Viewer groups may be present in some landscape units and not in others, as land uses and travel patterns may vary among landscape units within a project area. Three viewer groups were identified within the Caldecott Improvement Project area: 1) motorists who use the Caldecott Tunnel via State Route 24 to commute to and from points within the East Bay area; 2) recreational users who use the nearby recreational areas, as well as bicyclists and bicycle groups who tour along the surrounding roads and hills; and 3) residents living on the west side of the Caldecott Tunnel who have views of State Route 24 and, in some cases, the northbound tunnel portals on the west side of the Caldecott Tunnel.

Landscape Units

Landscape units are geographically discrete areas that are often separated by natural features such as bodies of water, ridges, or changes in vegetation. The Caldecott Tunnel separates two distinct spatial areas; therefore, two landscape units were identified for the purposes of the visual impact assessment: the West of the Tunnel Landscape Unit (LU) and the East of the Tunnel Landscape Unit (LU), as shown in Figure 2.1.6-1. The existing visual quality of the landscape units, including image types within each landscape unit and viewer groups with a degree of sensitivity to the visual environment are described below.

West of the Tunnel LU: The West of the Tunnel LU begins at the west tunnel portals and extends to the State Route 24/Broadway Interchange. Motorists, residents, and recreational users (including bicyclists and hikers) are the primary viewer groups in this landscape unit. Facing east toward the tunnel, the dominant visual elements are wooded hillsides, residences, State Route 24, access roads, and the tunnel entrances. The tunnel entrances, made of concrete with Art Deco design elements, provide vividness within the landscape unit that reflects the period in which they were built (1937). Facing west away from the tunnel, the dominant visual elements are wooded hillsides, residences, and

access roads. The views immediately exiting the tunnel in the westbound direction are limited by the steep hillsides that line the State Route 24 corridor. Further west, views open to the urban areas of North Oakland and South Berkeley with Emeryville and San Francisco Bay visible in the distance.

East of the Tunnel LU: The East of the Tunnel LU begins at the east tunnel portals and ends at the Camino Pablo Interchange on State Route 24. Motorists and bicyclists are the primary viewer groups in this landscape unit. Residences within this landscape unit are primarily located closer to the Camino Pablo Interchange, and residents have limited views of the highway due to distance, topography or dense vegetation. Most of this landscape unit is relatively undeveloped. Graded and wooded hills dominate the roadside views in areas closest to the tunnel portals. State Route 24, access roads, some utilities and the portal structures are the primary man-made image types.

Existing Visual Quality

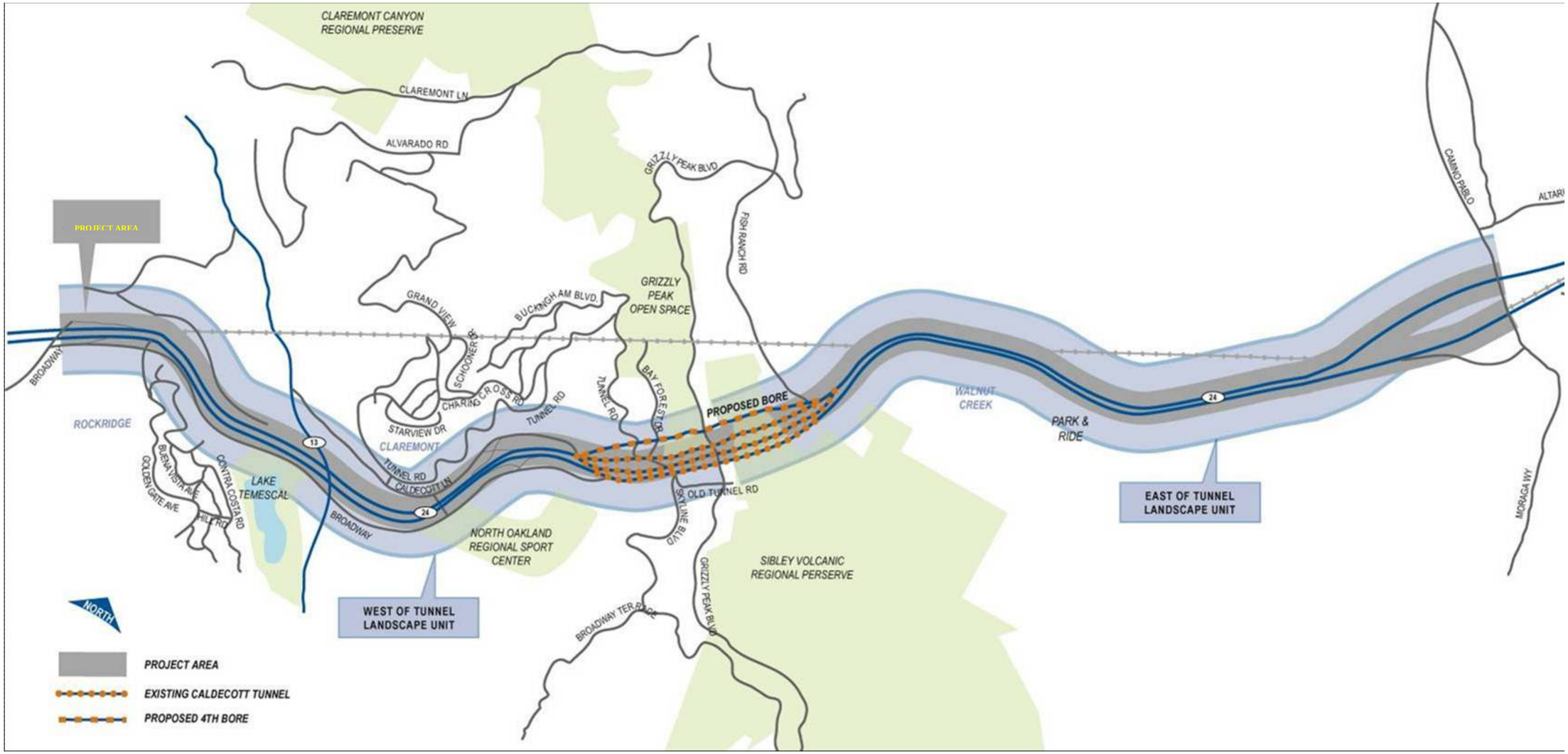
Key viewpoints, as shown in Figure 2.1.6-2, were identified to represent the visual character of the landscape units and used to define visual quality. The existing visual quality for each of the landscape units was evaluated based on indicators of the level of visual relationships, rather than judgments of physical landscape components. This approach provides a set of three evaluative criteria: vividness, intactness, and unity. These criteria are defined as follows:

- **Vividness** is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns. An example within the study area is the distinctive relationship of residences and the hillside observed from the existing Caldecott Tunnel;

- **Intactness** is the visual integrity of the natural and man-made landscape of the immediate environs and its freedom from encroaching elements. An example within the study area is the hillside area east of the tunnel, which is a natural area with few man-made features; and

- **Unity** is the visual coherence and compositional harmony of the viewshed. The viewshed entails all natural and man-made features found within the normal view range. In man-altered landscapes, it frequently attests to the careful design or fit of individual components in the landscape. An example is the way man-made elements, such as the tunnel entrance, combine with natural features, such as the hillside landscaping, to provide a coherent visage unique to the area.

Figure 2.1.6-1 Landscape Units



*Not to Scale

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Key Viewpoints

The key viewpoints are typical views that people would have of or from the project, as described below.

Viewpoint 1

This viewpoint is located on Tunnel Road in the West of the Tunnel LU, as shown in Figure 2.1.6-3. The view is looking east at the Caldecott Tunnel entrances and single- and multi-family residences on the hillside. Mid-slope residents, motorists and recreational bicyclists who use the surrounding access roads are the primary viewer groups in this area.

Viewpoint 2

This viewpoint is looking east from Hiller Drive in the West of the Tunnel LU, as shown in Figure 2.1.6-4. The view includes State Route 24, the tunnel portals, wooded hillsides and single-family hillside residences and multi-family residences located on Caldecott Lane. Upper-slope residents and motorists and recreational bicyclists on local access roads are the primary viewer groups in this area.

Viewpoint 3 and 3a

These viewpoints are located on State Route 24 in the West of the Tunnel LU. The views are looking east from the Broadway on-ramp to one of the tunnel entrances, as shown in Figure 2.1.6-5 and 2.1.6-5a. The view includes State Route 24, the tunnel entrance, hillside access roads, single-family hillside residences, and wooded hillsides. Motorists traveling east on State Route 24 are the primary viewer group in this area. Viewpoint 3a was added to show the latest design refinements to the west portal and the Operations and Maintenance Center (OMC) from the motorist's viewpoint. Viewpoint 3a was photographed from the existing eastbound center median, approximately 19.5- meter (64-feet) north (directly adjacent) from Viewpoint 3.

Viewpoint 4

This viewpoint is located where State Route 24 would exit the new bore in the West of the Tunnel LU, looking westward, as shown in Figure 2.1.6-6. The view includes a portion of State Route 24 shoulder area, landscaped areas in the foreground, and wooded hillsides in the distance. Westbound motorists exiting the tunnel portals on State Route 24 are the primary viewer group in this area.

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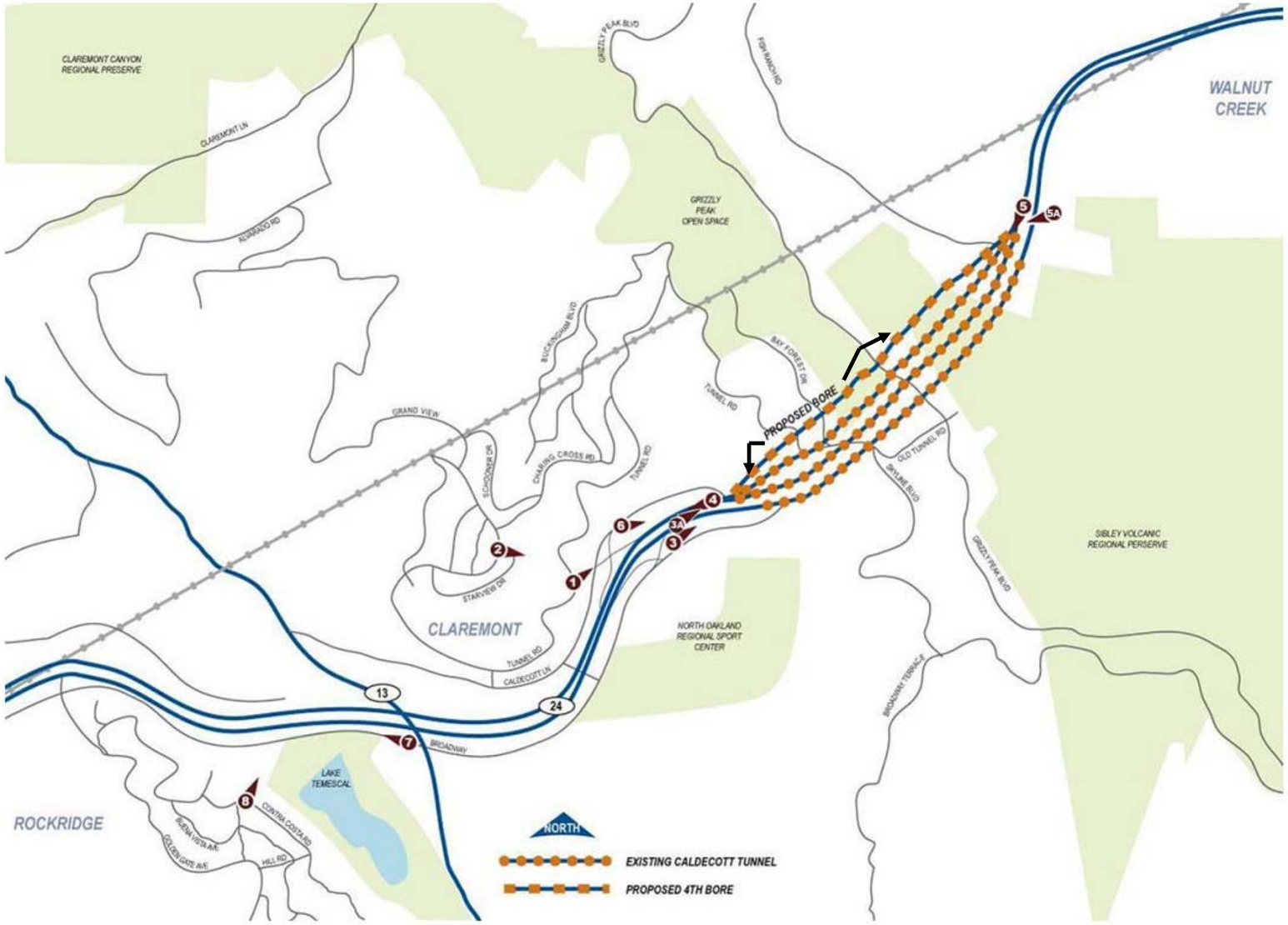
Figure 2.1.6-2 Viewpoint Locations



* Not to scale

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Viewpoint 5 and 5a

These viewpoints are located on westbound State Route 24 approaching the eastern portal of the Caldecott Tunnel near the Fish Ranch Road on-ramp, as shown in Figure 2.1.6-7 and 2.1.6-7a. The views include State Route 24 and wooded hillsides. Motorists traveling on State Route 24 are the primary view group in this area. Viewpoint 5a was added to show the latest design refinements to reduce the potential adverse impacts of the proposed retaining wall.

Viewpoint 6

This viewpoint is located on Caldecott Lane, north of State Route 24, looking toward the existing western tunnel portals, as shown in Figure 2.1.6-8. The view includes Caldecott Lane in the foreground, landscaped areas between Caldecott Lane and State Route 24, hillside single-family residences, and distant wooded hillsides. Lower-slope residents (residents of the Parkwoods Condominiums), and motorists and recreational bicyclists on local access roads are the primary viewer groups in this area.

Viewpoint 7

This viewpoint is located on Broadway, south of State Route 24 and just west of the State Route 24/State Route 13 Interchange, as shown in Figure 2.1.6-9. The view, looking west near Lake Temescal, includes State Route 24, Broadway, which is the frontage road to State Route 24, and mature trees located at Lake Temescal. Motorists on local access roads who may be visiting Lake Temescal, and bicyclists that use local access roads for recreation are the primary viewer groups in this area.

Viewpoint 8

This viewpoint is located on Contra Costa Road looking northeast toward State Route 24 and the Hiller Highlands area, as shown in Figure 2.1.6-10. This view includes trees and vegetation associated with Lake Temescal in the foreground, State Route 24 and the off-ramp to State Route 13, wooded hillsides in the distances, and single- and multi-family residents of the Hiller Highlands community at the top of the distant hill. Upper-slope residents, and motorists and recreational bicyclists on local access roads are the primary viewer groups in this area.

Figure 2.1.6-3 Viewpoint 1- Existing view of West Portal from Tunnel Road

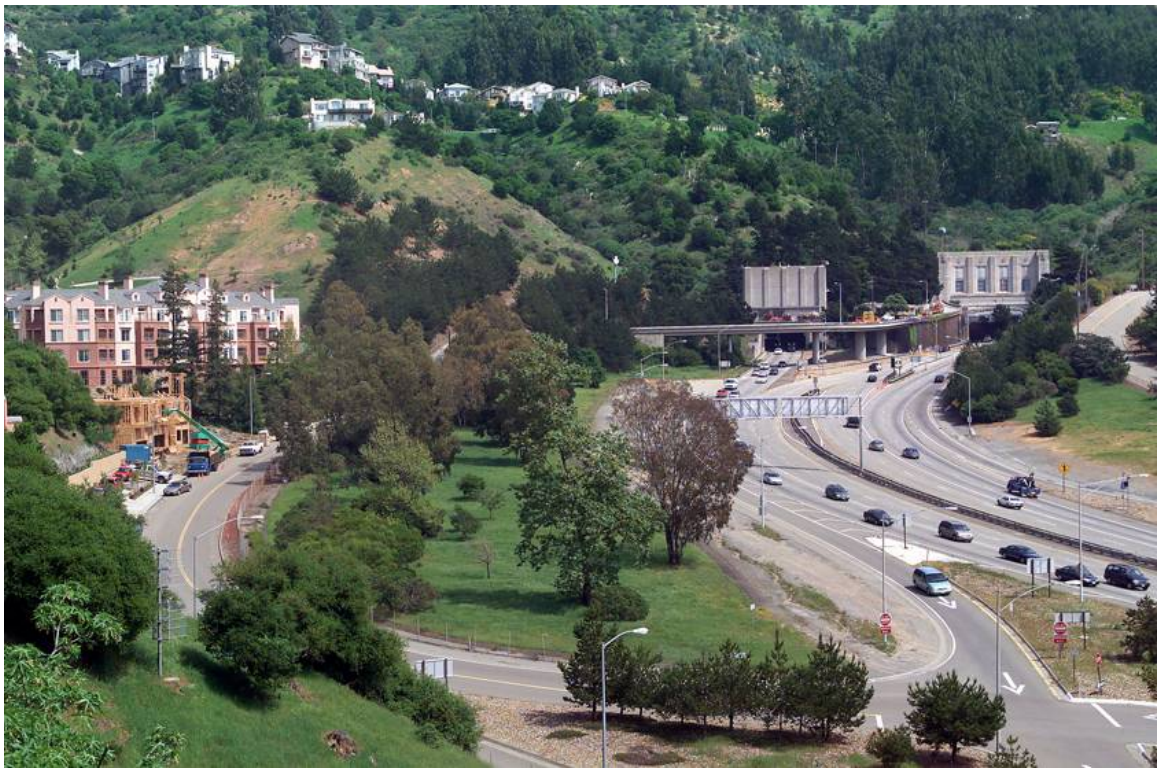


Figure 2.1.6-4 Viewpoint 2- Existing view of West Portal from Hiller Drive

Figure 2.1.6-5 Viewpoint 3- Existing view of West Portal from Broadway On-Ramp

Figure 2.1.6-5a Viewpoint 3a- Existing view of West Portal from Broadway On-Ramp (Viewpoint added 3/29/07)

Figure 2.1.6-6 Viewpoint 4- Existing view from the Proposed West Portal

Figure 2.1.6-7 Viewpoint 5- Existing view of East Portal from Fish Ranch Road On-Ramp

Figure 2.1.6-7a Viewpoint 5a- Existing view toward East Portal from above Fish Ranch Road On-Ramp (Viewpoint added 3/29/07)

Figure 2.1.6-8 Viewpoint 6- Existing view of Caldecott Lane looking towards the proposed West Portal

Figure 2.1.6-9 Viewpoint 7- Existing view from Broadway, north of Lake Temescal, looking west

Figure 2.1.6-10 Viewpoint 8- Existing view of Contra Costa Road, looking northeast toward State Route 24

2.1.6.3 IMPACTS

The following section analyzes the potential visual impacts of the proposed project within the two landscape units that make up the project study area. The methodology used to assess visual impacts combines the two principal visual impact components: visual resource change and viewer response to that change. "Visual resource change" is analyzed in terms of visual dominance and other visual effects of facilities that would be constructed under the proposed project, together with the change in visual quality. "Viewer response" to these changes is interpreted on the basis of the viewer types identified.

Visual Resource Change

Visual changes as a result of the build alternatives in the West of the Tunnel LU and East of the Tunnel LU are described below.

West of the Tunnel Landscape Unit

Alternatives 2N, the Preferred Alternative, and 3N would result in similar visual changes to this landscape unit. Both build alternatives include a new bore and portal façade north of the existing bores; realignment of the Caldecott Lane on- and off-ramps to standard hook ramps; a new Operations and Maintenance Center (OMC) that would replace the existing OMC in the area between the two existing portals; and retaining walls at the newly-constructed portal along State Route 24. Alternative 3N would include an additional travel lane and a larger tunnel in height and width. Viewer groups that would be affected by changes in the visual setting in this landscape unit include motorists, residents and recreational users.

Motorists: Motorists traveling east on State Route 24 would have views of the new portal façade and OMC. Eastbound motorists would not be substantially affected by this view, however, because the new portal façade would be located on the opposite side of the highway. The new portal and the OMC would be designed to match in color and form with the existing facades. Eastbound motorists would also see the proposed soundwall along the south side of State Route 24 near the State Route 13 Interchange if it were constructed. This soundwall could block views of Lake Temescal Park for some motorists but would not result in view obstruction of the surrounding wooded hillside areas and hillside residences.

The most substantial visual change in this landscape unit for motorists would occur in the immediate vicinity of the new tunnel portal and along the westbound lanes to the Caldecott Lane exit. Immediately adjacent to the new tunnel portal, two variable height retaining walls would be constructed (one on each side of the travel way). On the north side of the portal, a 2.2 meter (7 foot) to 12-meter (40-foot)-high retaining wall would be built. On the south side, a 2.6-meter (9-foot) to an 8-meter (26-foot)-high retaining wall may be built. These retaining walls would appear to the motorists as logical extensions of the tunnel they have just emerged from. In the area immediately to the west there are two options being considered to address potential noise impacts. Each of these options and their effect on the motorists' view are discussed below.

Option 1 – Soundwall. Under this option, a 4.9-meter (16-foot)-high, 292-meter (958-foot)-long soundwall would be constructed on the north side of State Route 24 from the tunnel exit to the Caldecott Lane off-ramp. To accommodate the construction of the tunnel, soundwall, and staging activities, all of the mature vegetation would be removed in the area bounded by State Route 24, Caldecott Lane, and the Caldecott Lane off-ramp, except for a small strip adjacent to Caldecott Lane that would be retained to provide some visual screening. The view for motorists exiting the tunnel in the westbound direction would change from a view of grass and mature trees in the immediate foreground to views of a soundwall. The wall would appear as a logical extension of the tunnel and

retaining walls in this area. The visual change for motorists would be considered minimally adverse. Figure 2.1.6-11 shows Option 1 in plan view and cross-section in the Caldecott Lane area. This option is not included in the Preferred Alternative (see Section 2.2.8.4).

Option 2-Berm/Soundwall. Under this option, a 6-meter (19-foot)-high berm would be constructed between State Route 24 and Caldecott Lane with a 2.4-meter (8-foot)-high soundwall on top to provide noise mitigation. To construct the berm, all of the vegetation in this area would be removed during construction. The berm and soundwall would provide visual screening of the adjacent multi-family residences in this area (Parkwoods Condominiums). This option would have less impact on motorists than Option 1 because after revegetating the berm, motorists would have similar foreground views as they do today (grasses, trees and shrubs). Figure 2.1.6-12 shows a plan view and cross-section of Option 2 in the Caldecott Lane area. This option is included in the Preferred Alternative (see Section 2.2.8.4).

Option 3-Berm. A second berm would be constructed immediately west of the Caldecott Lane hook ramp. It would have the same general appearance and serve the same purpose as the other berm, but would not include a soundwall. The second berm would screen views of the frontage road from State Route 24 and views of State Route 24 from residential properties that are currently being developed at this location. Like the other berm, the second berm would be landscaped according to Caltrans standards and is expected to be a positive visual element that will help improve the appearance of the highway corridor in this area. This option is not included in the Preferred Alternative (see Section 2.2.8.4).

Residents: Vegetation removal and construction of the new tunnel entrance, OMC, retaining walls and soundwalls would have varying degrees of effect on residents. Upper- and mid-slope residents located north and south of State Route 24 would see visual changes (new tunnel portal, OMC, retaining walls and soundwalls). However, due to their distance from the project area, their sensitivity to these changes would be low to moderate. Lower-slope residents, particularly residents on Caldecott Lane, have the potential to be the most directly affected by the project. For these residents, changes occurring along the westbound lanes of State Route 24 between the new tunnel portal and Caldecott Lane have the most potential to create adverse visual effects. Each of the options for this area and their potential visual impact on lower-slope residents is discussed below.

Option 1–Soundwall. Under this option lower-slope and ground plane residents would experience the loss of existing vegetation and the construction of a 4.9-meter (16-foot) high soundwall. The soundwall would provide some visual screening for lower-slope residents, but it would not be as effective as the existing mature vegetation.

Option 2 - Berm/Soundwall. Under the Berm/Soundwall Option lower-slope residents would be provided a more effective visual screen than under Option 1.

Figure 2.1.6-11 Cross Section and Plan View of Option 1: Soundwall

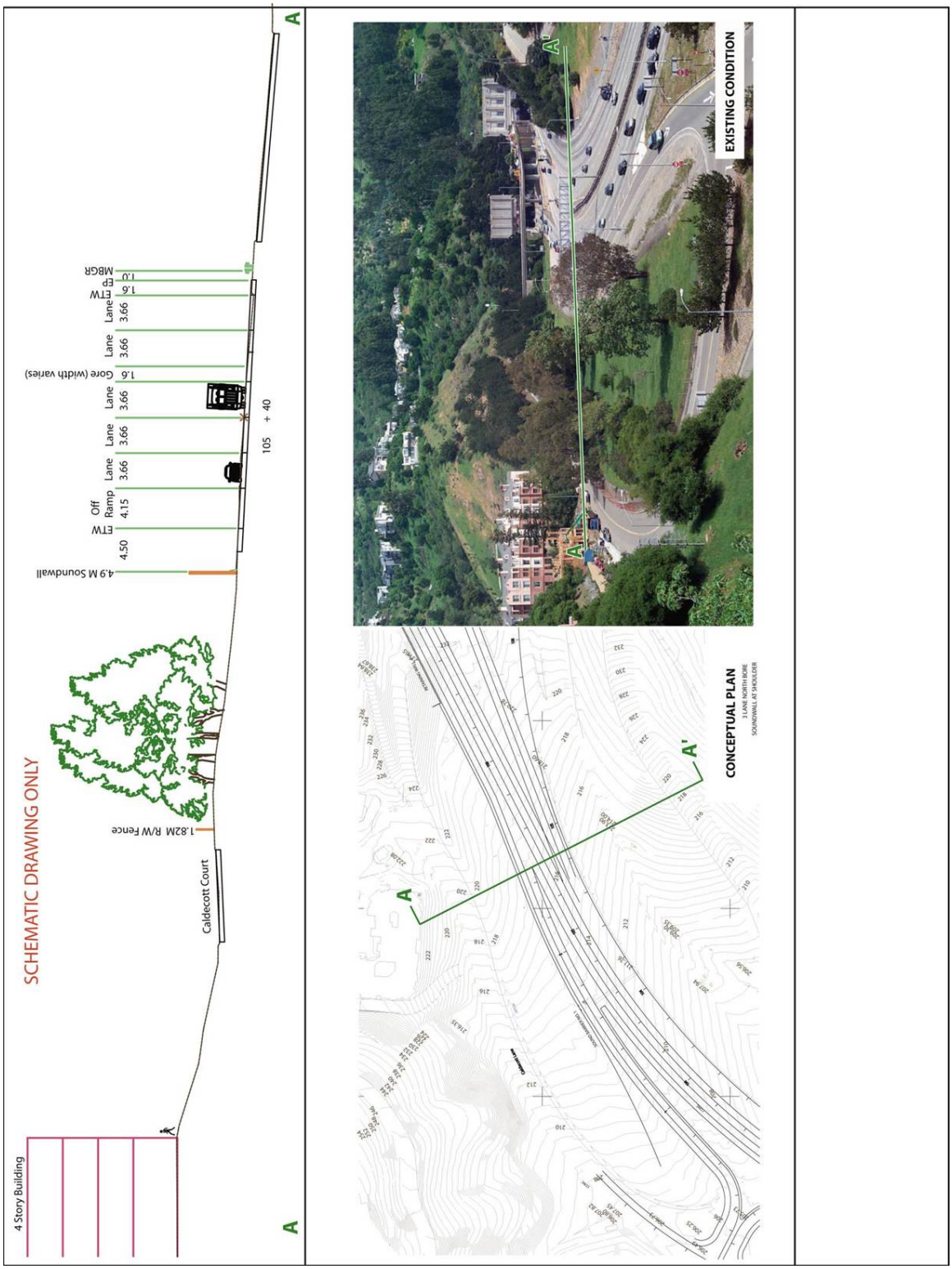


Figure 2.1.6-12 Cross Section and Plan View of Option 2: Berm/Soundwall

Recreational Users: Bicyclists typically ride on mid- and upper-slope access roads and trails, which, given the distance to the Caldecott facilities, would reduce their sensitivity to visual changes. The primary visual changes in the project area (tunnel portal, OMC, retaining walls and soundwalls) would occur in areas fairly distant from most routes used by recreational bicyclists. The soundwall, if constructed along State Route 24 in the vicinity of Lake Temescal, is the exception. Broadway in this area is frequently used by recreational cyclists who would be exposed to the new soundwall. The effect on bicyclists' views would be negligible, however, because bicyclists in this area already have exposure to large retaining walls associated with State Route 24 and State Route 13. As a result, the new soundwall would not result in a substantial visual change for these users. Other recreational users such as those at Lake Temescal would have some visual exposure to the new soundwall on State Route 24, which would minimally obstruct views across the highway but would also obstruct views of vehicular traffic, resulting in a beneficial effect for park users.

East of the Tunnel Landscape Unit

Alternatives 2N and 3N would result in similar visual changes to this landscape unit. All construction activities would occur along the north side of State Route 24. Both build alternatives would involve the removal of vegetation to construct a new tunnel entrance structure and widen State Route 24 near the Fish Ranch Road off-ramp as it approaches the eastern portal of the tunnel. Under both build alternatives, two retaining walls would be constructed, one on each side of the westbound travel way as the roadway approaches the new tunnel entrance. On the north side of the portal, a 2.39-meter (7.84-foot) to 8.41-meter (27.59-foot)-high retaining wall would be built. On the south side, a 0.52-meter (1.71-foot) to 6.81-meter (23.34-foot)-high retaining wall would be built. These walls would introduce substantial new man-made features into this landscape unit. Construction of these retaining walls would also require grading and removal of vegetation. The visual changes created by these walls would primarily affect motorists on State Route 24.

Motorists: Motorists traveling westbound would have visual exposure to the new tunnel entrance portal. This would not be considered a substantial change because the portal would appear similar to the existing portals. The new retaining walls would introduce a new visual feature and be highly visible to motorists; however, they would not block views or be out of character with the existing freeway corridor.

Vegetation removal would occur to accommodate the new portal and additional lanes. Most of this vegetation loss would occur near the new portal. For motorists traveling toward the portal, the façade is the dominant visual element, and motorists are typically less visually sensitive than other viewer groups. The loss of vegetation would result in only a slightly adverse impact to motorists.

Visual Changes and Effect on Viewer Groups

The following section discusses the impacts of each alternative at each of the eight viewpoints.

Viewpoint 1

The existing view of the west portal from Tunnel Road is shown in Figure 2.1.6-3. As shown in Figures 2.1.6-13 and 2.1.6-14, Alternatives 2N and 3N with Option 1 – Soundwall would introduce a new tunnel portal structure (and OMC in Figure 2.1.6-16a) widened State Route 24 and new soundwall into the visual setting from Viewpoint 1. Option 2 - Berm/Soundwall would introduce the same project elements into the visual landscape but as an alternative to the soundwall in Option 1, a berm with a shorter soundwall would be constructed in the area along Caldecott Lane, as shown in Figures 2.1.6-15, 2.1.6-16, and 2.1.6-18. The berm/soundwall combination would provide better sound and visual screening for residents along Caldecott Lane. Construction of the berm/soundwall

would require the initial removal of more vegetation than under Option 1, affecting views of mid-slope residents for the 10 to 15 years before re-establishment of vegetation. Both options would result in minimally adverse effects to the overall visual quality of the view for mid-slope residents. The perception of the visual changes for recreational bicyclists would be even less due to the reduced time of exposure as compared to residents.

Figure 2.1.6-13 Viewpoint 1 (Option 1)

(Simulated condition showing view of West Portal from Tunnel Road immediately following construction-Alternative 3N)

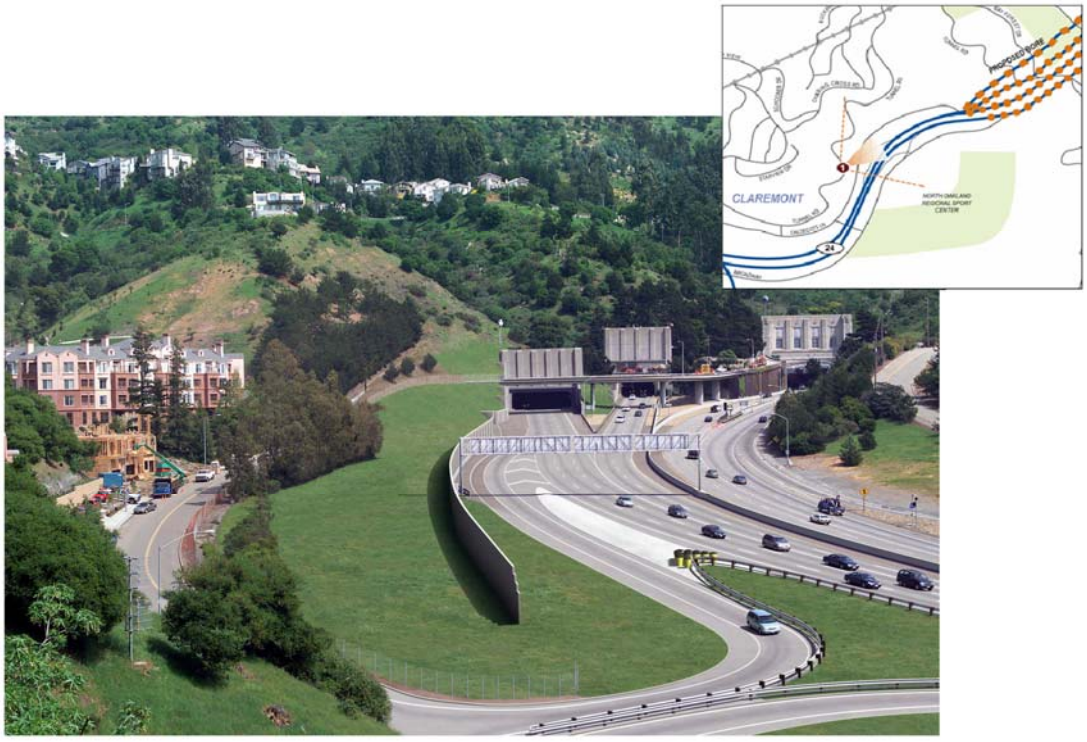


Figure 2.1.6-14 Viewpoint 1 (Option 1)

(Simulated condition showing re-establishment of vegetation at 10-15 years-Alternative 3N)

Figure 2.1.6-15 Viewpoint 1 (Option 2)

(Simulated condition showing view of West Portal from Tunnel Road immediately following construction-Alternative 3N)

Figure 2.1.6-16 Viewpoint 1 (Option 2)

(Simulated condition showing re-establishment of vegetation at 10-15 years-Alternative 3N)

Figure 2.1.6-16a Viewpoint 1 (Option 2)

(Simulated condition showing view of West Portal and OMC from Tunnel Road immediately following construction-Alternative 2N – Simulation added 3/29/07)

Figure 2.1.6-16a Viewpoint 1 (Option 2)

(Simulated condition showing re-establishment of vegetation at 10-15 years-Alternative 2N – Simulation added 3/29/07)

Viewpoint 2

The existing view of the west portal from Hiller Drive is shown in Figure 2.1.6-4. From Viewpoint 2, both build alternatives would result in similar changes to the visual setting; they would introduce a new tunnel portal structure, new OMC, widen State Route 24 and remove vegetation around the new portal area and along Caldecott Lane during construction, as shown in Figures 2.1.6-17 to 2.1.6-20 (new OMC not shown). The addition of the new portal and travel lanes would be visible from this view; however, the roadway, OMC, and tunnel improvements would not detract from the overall visual quality because of the distance and elevation of the observer viewpoint. In addition, many of the residents responding to the visual preference survey indicated that one of the biggest visual detractors to their views is the back-up of cars on State Route 24 during peak commute periods, which is quite visible from upper-slope areas. With the project, these backups should be reduced, resulting in a minimally beneficial effect on the overall visual quality for upper-slope residents.

Figure 2.1.6-17 Viewpoint 2 (Option 1)

Simulated condition showing view of West Portal from Hiller Drive immediately following construction)

Figure 2.1.6-18 Viewpoint 2 (Option 1)

(Simulated condition showing re-establishment of vegetation at 10-15 years.)

Figure 2.1.6-19 Viewpoint 2 (Option 2)

(Simulated condition showing view of West Portal from Hiller Drive immediately following construction)

Figure 2.1.6-20 Viewpoint 2 (Option 2)

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Viewpoint 3

The existing view of the west portal from the Broadway on-ramp is shown in Figure 2.1.6-5. Both build alternatives would introduce similar elements into the visual setting at Viewpoint 3, including the new tunnel portal structure, (and new OMC shown in Figure 2.1.6-24a), and widened State Route 24, and would require the removal of vegetation during construction. Option 1 – Soundwall and Option 2 – Berm/Soundwall would also affect views to some extent, as shown in Figures 2.1.6-21 to 2.1.6-24. Given that motorists are less sensitive to visual change than other viewer groups, combined with the medium overall visual quality of the existing setting, the project would result in a negligible effect on overall visual quality.

Figure 2.1.6-21 Viewpoint 3 (Option 1)

(Simulated condition showing view of West Portal from Broadway On-Ramp immediately following construction)

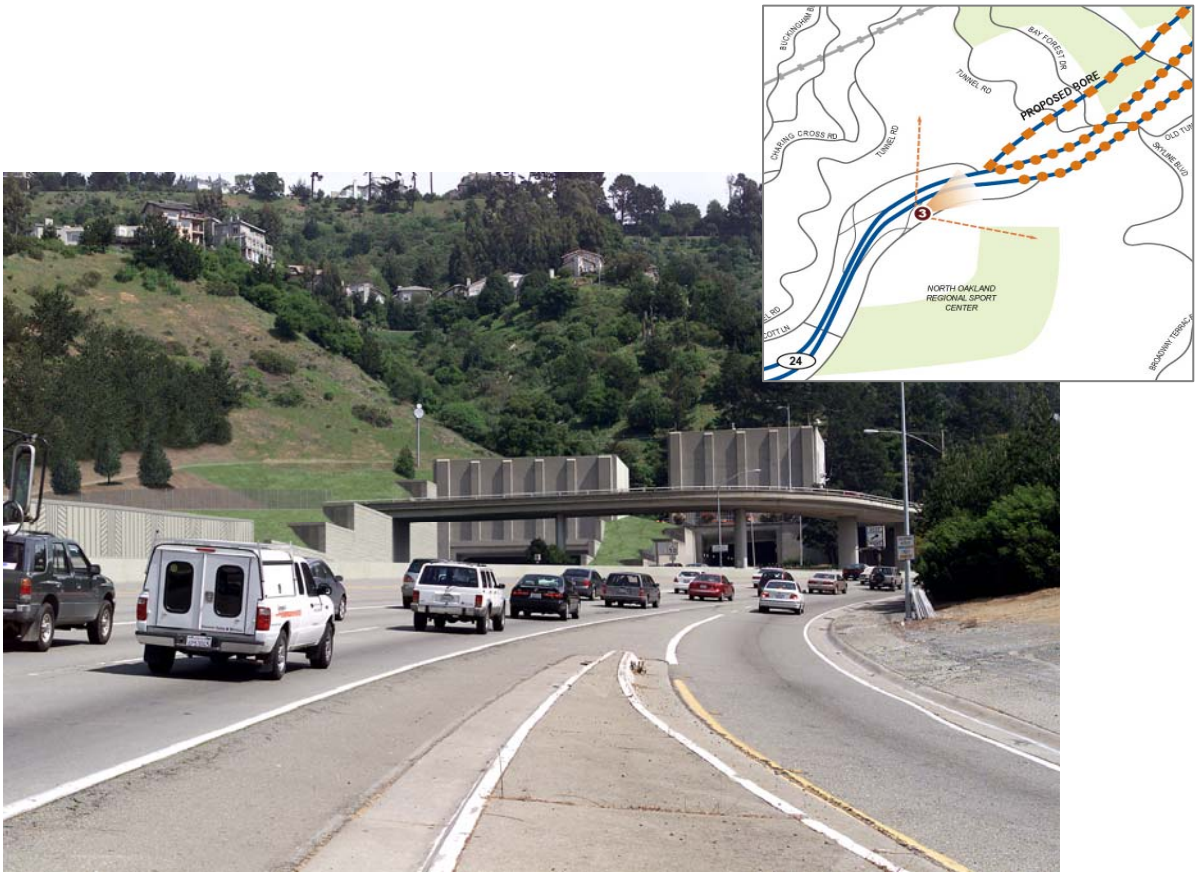


Figure 2.1.6-22 Viewpoint 3 (Option 1)

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Figure 2.1.6-23 Viewpoint 3 (Option 2)

(Simulated condition showing view of West Portal from Broadway On-Ramp immediately following construction)

Figure 2.1.6-24 Viewpoint 3 (Option 2)

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Figure 2.1.6-24a Viewpoint 3a (Option 2)

(Simulated condition showing view of West Portal from Broadway On-Ramp immediately following construction – Simulation added 3/29/07)

Figure 2.1.6-24a Viewpoint 3a (Option 2)

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Viewpoint 4

The existing view from the proposed west portal is shown in Figure 2.1.6-6. Under Option 1 – Soundwall, both build alternatives would result in several changes to the landscape from Viewpoint 4, including a widened State Route 24, a 45-meter (148-foot) - long, 12-meter (40-foot) – high retaining wall along the westbound shoulder at the tunnel exit, a new 275-meter (900-foot) - long, 4.9-meter (16-foot) - high soundwall along the shoulder of the westbound lanes to reduce noise levels, and the removal of vegetation. Given that motorists are less sensitive to visual change than other viewer groups, combined with the medium overall visual quality of the existing setting, the project would result in only a minimally adverse effect on overall visual quality. Visual simulations depicting Alternative 3N with Option 1 – Soundwall are shown in Figures 2.1.6-25 and 2.1.6-26.

Option 2 – Berm/Soundwall would introduce similar elements into the visual landscape as described above. Instead of a soundwall, however, an earthen berm with a soundwall on top would be constructed along the westbound shoulder of State Route 24, between the off-ramp and Caldecott Lane. This option would still require the removal of vegetation between State Route 24 and Caldecott Lane, but the earthen berm would be planted with shrubs and trees. The berm would provide better unity with surrounding wooded hillsides and would improve overall visual quality. Visual simulations depicting Alternative 3N with Option 2 – Berm/Soundwall are shown in Figures 2.1.6-27 and 2.1.6-28.

Figure 2.1.6-25 Viewpoint 4 (Option 1)

(Simulated condition showing westward view from the proposed West Portal immediately following construction)

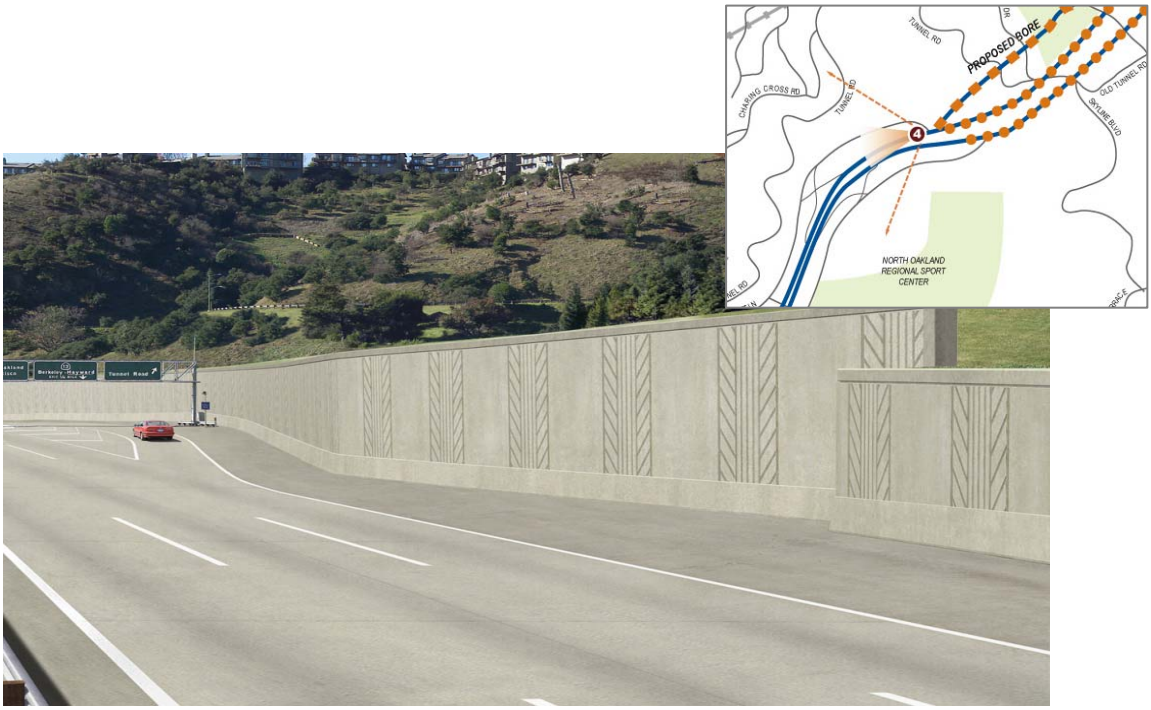


Figure 2.1.6-26 Viewpoint 4 (Option 1)

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Figure 2.1.6-27 Viewpoint 4 (Option 2)

(Simulated condition showing westward view from the proposed West Portal immediately following construction)

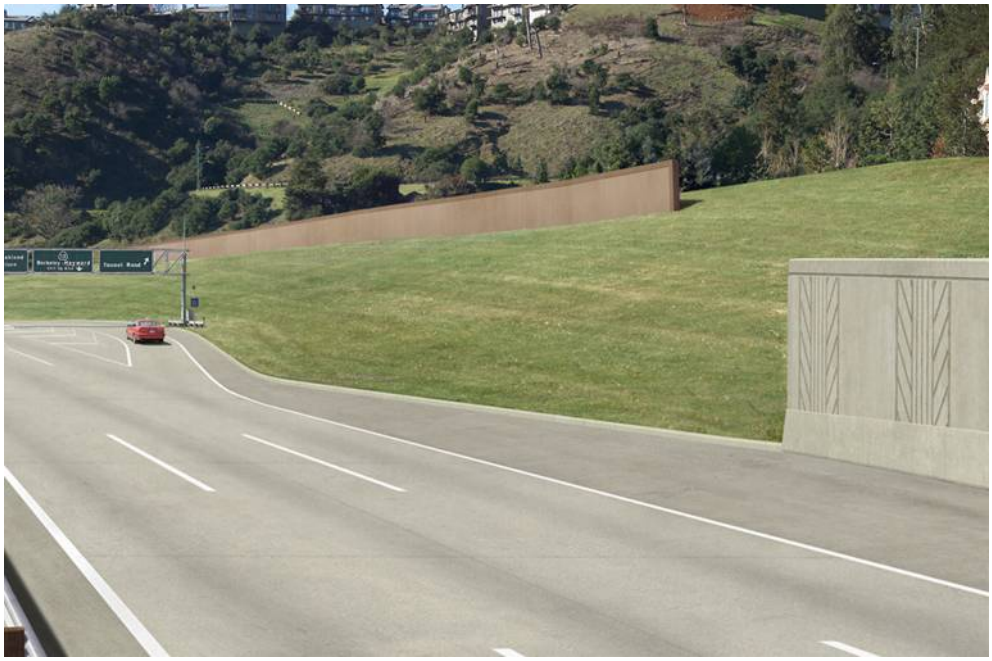


Figure 2.1.6-28 Viewpoint 4 (Option 2)

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Viewpoint 5

The existing view from the Fish Ranch Road on-ramp to the east portal is shown in Figure 2.1.6-7. Both build alternatives would introduce new elements into the view from Viewpoint 5, including a widened State Route 24 and on-ramp from Fish Ranch Road, as shown in Figures 2.1.9-29 and 2.1.6-30. A retaining wall and the new tunnel portal would be partially visible. The project would also result in the removal of vegetation in this area during construction. Introduction of a retaining wall and removal of vegetation during construction would result in a minimal adverse effect on overall visual quality. Motorists would be exposed to these visual changes for a relatively short duration, and therefore, would be only moderately sensitive to them.

Figure 2.1.6-29 Viewpoint 5

(Simulated condition showing view of East Portal from Fish Ranch Road On-Ramp immediately following construction.)

Figure 2.1.6-30 Viewpoint 5

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Viewpoint 5a

Since the circulation of the DEA/EIR design refinements have been made to reduce the potential adverse impacts of the proposed retaining wall. In general, the overall retaining wall height (top of wall to roadway pavement) has been reduced by approximately 1.37 m (4.5 ft) at its highest point and up to approximately 5.6 m (18 ft) immediately adjacent to the proposed east portal. Although the length will remain the same at 286.3 m (939 ft), the maximum height of the retaining wall above the freeway would be 6.85 m (22.5 ft) and 7.6 m (25 ft) at the portal opening. Two retaining wall design options are being considered and are depicted in Viewpoint 5a, Figures 2.1.6-30a and 2.1.6-30b . This viewpoint is located on a hillside above eastbound State Route 24 and Old Tunnel Road off-ramp, east of the Caldecott Tunnel, and was selected to depict as much of the proposed retaining wall as possible for both options. Option 1 consists of a stepped retaining wall, which would architecturally tie into the east portal structure. Option 2 consists of a retaining wall that is carved and stained to give it a more natural appearance. Final aesthetic surface treatments will be determined during the design stage in consultation with local agencies.

An additional 1.5 m (5 ft) high and 83.9m (275 ft) long retaining wall will be constructed along the outer edge of Fish Ranch Road adjacent to the east portal structure and would consist of a soldier pile system with timber lagging. This wall allows for a reduction in height to the longer retaining wall described above. Landscaping will be provided to screen this wall from motorists.

Figure 2.1.6-30a Viewpoint 5a (Option 1)

(Simulated condition showing view of East Portal from Fish Ranch Road On-Ramp immediately following construction.)

Figure 2.1.6-30a Viewpoint 5a (Option 1)

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Figure 2.1.6-30b Viewpoint 5a (Option 2)

(Simulated condition immediately following construction)

Figure 2.1.6-30b Viewpoint 5a (Option 2)

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Viewpoint 6

The existing view from Caldecott Lane, looking towards the proposed west portal is shown in Figure 2.1.6-7. Two options for mitigating noise impacts would introduce new elements into the view from Viewpoint 6 under both build alternatives. Option 1- with Soundwall would result in the removal of most of the mature landscaping in the foreground with the exception of a thin strip along the south side of Caldecott Lane. A new soundwall would be constructed along the north side of State Route 24, and with the vegetation removal during construction, the new wall would be highly visible to lower slope residents. Visual simulations depicting Alternative 3N with Option 1 – Soundwall are shown in Figures 2.1.6-31 and 2.1.6-32. Option 2 - Berm/Soundwall would have similar effects, however, instead of constructing only a soundwall, the build alternatives would include a combined berm and soundwall in the area between Caldecott Lane and State Route 24 resulting in a lesser overall visual change. Visual simulations depicting Alternative 3N with Option 2 – Berm/Soundwall are shown in Figures 2.1.6-33 and 2.1.6-34. With the removal of vegetation during construction, the new tunnel portal and new berm and soundwall would be visible to lower-slope residents for the 10 to 15 years before re-establishment of vegetation. This would result in a minimally adverse effect on area residents because of the creation of views to State Route 24 and reduced privacy for upper story residents. After the vegetation has matured, the effect would actually be minimally beneficial, as the privacy and rural feel of the view would be enhanced.

Figure 2.1.6-31 Viewpoint 6 (Option 1)

(Simulated condition showing view from Caldecott Lane, looking towards the proposed West Portal, immediately following construction)

Figure 2.1.6-32 Viewpoint 6 (Option 1)

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Figure 2.1.6-33 Viewpoint 6 (Option 2)

(Simulated condition showing view from Caldecott Lane, looking towards the proposed West Portal, immediately following construction)

Figure 2.1.6-34 Viewpoint 6 (Option 2)

(Simulated condition showing re-establishment of vegetation at 10-15 years)

Viewpoint 7

The existing view from Broadway, north of Lake Temescal, looking west is shown in Figure 2.1.6-9. As shown in Viewpoint 7 (Figure 2.1.6-35), the build alternatives could construct two new 3.7-meter (12-foot)-high soundwalls along State Route 24 and the off-ramp to State Route 13. The soundwalls along the off-ramp to State Route 24 would be constructed on top of the two existing retaining walls. The southwest length of the existing retaining wall on the south side of the ramp is 100 meters (328.08 feet). This portion of the south retaining wall varies in height from 7.2 meters (23.78 feet) to 6.62 meters (21.73 feet). The soundwall length of the existing retaining wall on the north side of the ramp is 150 meters (492 feet). This portion of the north retaining wall varies in height from 1.07 meters (3.5 feet) to 6.85 meters (22.49 feet). From this viewpoint, and given the extent of hardscape in the existing view, the project would have a negligible effect on overall visual quality and character. Construction of the soundwalls would improve privacy and block views of motorists on State Route 24 and the off-ramp to State Route 13 for motorists and recreational users along Broadway, resulting in a minimal beneficial effect on these viewer groups. These soundwalls have not been included as part of the project (See section 2.2.8.4).

Figure 2.1.6-35 Viewpoint 7

(Simulated condition showing view from Broadway, north of Lake Temescal, looking west, immediately following construction)

Viewpoint 8

The existing view of Contra Costa Road, looking northeast toward State Route 24 is shown in Figure 2.1.6-10. Both build alternatives may introduce a new soundwall along the eastbound shoulder of State Route 24, as shown in Viewpoint 8 (Figure 2.1.6-36). Residents typically have a relatively high sensitivity to visual change; however, this is reduced for upper-slope residents because of their distance from State Route 24. Motorists represented by this view would be on local access roads. Because of the relatively long distance and short duration of view exposure, motorists would have low sensitivity to these visual changes. Bicyclists on local access roads would also have a moderate sensitivity to these changes because of the distance and type of activity. Given the distance, viewing angle and minimal new elements introduced into the visual setting, the project would result in a negligible effect on the overall visual quality from this viewpoint.

Figure 2.1.6-36 Viewpoint 8

(Simulated condition showing view from Contra Costa Road, looking northeast toward State Route 24)

2.1.6.4 NEW SOURCES OF ILLUMINATION

The project occurs within the confines of two broadly defined environmental lighting zones, which have been adopted as the basis of exterior lighting design for all projects that must comply with the State Energy Code, California Code of Regulations, Title 24, Part 1. Environmental lighting zone LZ2 applies to year 2000 U.S. Census defined rural areas characterized by low ambient light levels, which encompasses most of the terrain east of Grizzly Peak and the tunnel's east portal.

Environmental lighting zone LZ3 applies to year 2000 U.S. Census defined urban areas characterized by medium ambient light levels and encompasses most of the terrain west of Grizzly Peak and the tunnel's west portal.

The project introduces both temporary and permanent lighting sources with potential for adverse effects to nighttime views in the area. These sources occur in two environmental zones of differing sensitivity and differing viewer constituency. The potential impact of the sources is evaluated relative to limiting criterion levels for each environmental zone. The visual impacts assessed include glare, light trespass, man-made sky glow and surface brightness.

The area of study is further limited by the relative location of newly installed lighting and potential observers. An area within each lighting zone was established roughly 0.8Km (0.5 mile) from the prospective location of any new light source. The areas are identified as East Viewshed and West Viewshed as illustrated in by Figure 2.1.6.35.

Within the East and West Viewsheds the existing lighting systems include conventional freeway on and off-ramp lighting, standard roadway lighting, standard signage lighting and tunnel lighting designed to aid the motorist in adapting to lighter and darker environments. The West Viewshed has, in addition, exterior site lighting for the existing Operations and Maintenance Center (OMC) near the west portal of the third bore. These systems were designed to comply with recommended lighting practice at the time and have been successfully operating for many years.

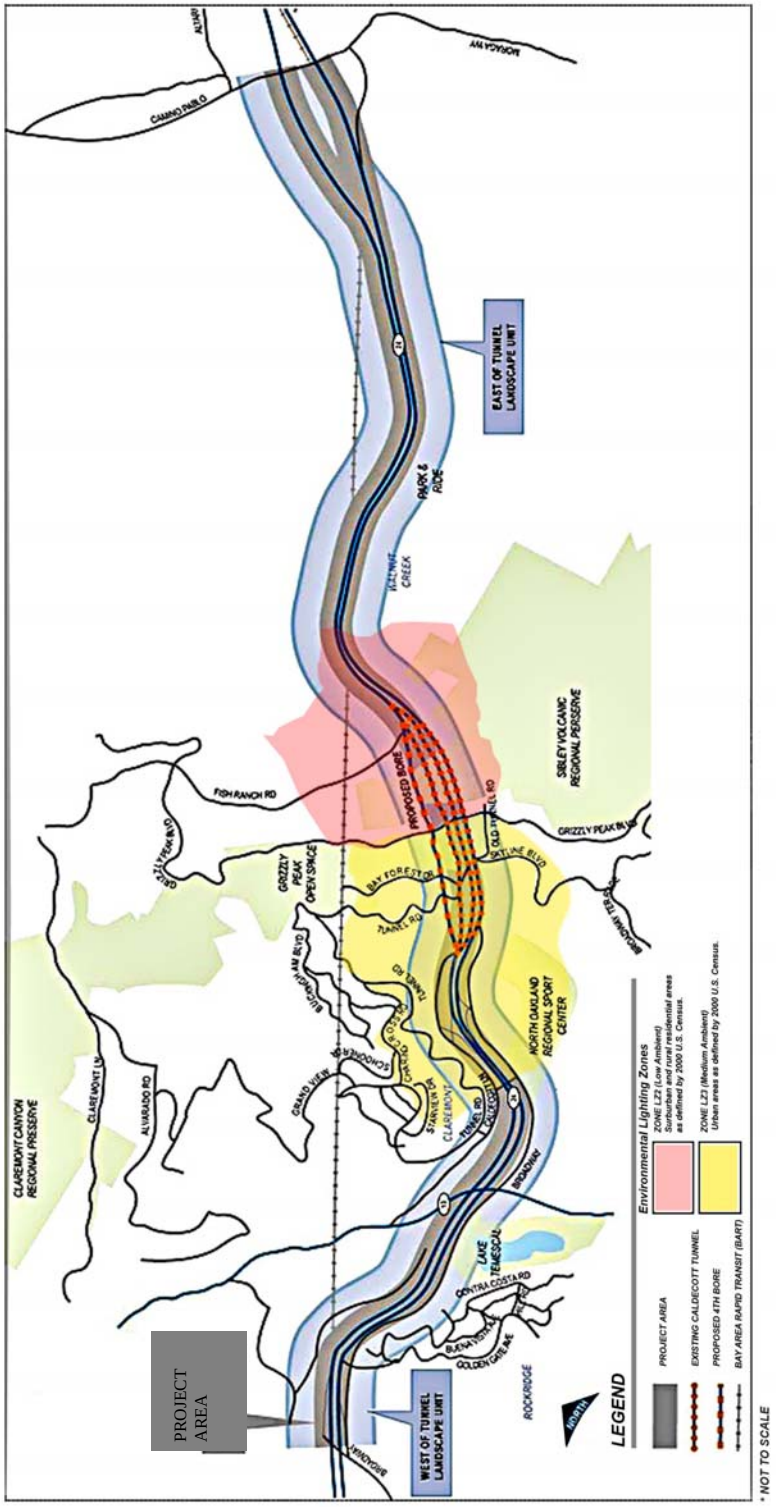
New lighting systems that will be introduced as part of the projectinclude both temporary and permanent installations. Temporary lighting installations include site lighting for construction staging areas at both the west and east portals; and portable generator mounted lighting for paving, tunneling, and other construction activities. Permanently installed new lighting will include safety and security lighting for electrical substation buildings constructed above the east and west portal of the fourth bore; new tunnel lighting; and, realigned and up-dated on and off ramp lighting for Fish Ranch Road east of the tunnel and Caldecott Lane, west of the tunnel. In addition the West Viewshed will include site lighting for a replacement OMC at the site of the existing facility.

Negative impacts from lighting result when excessive light impinges on an unintended location and is sufficient to cause annoyance, discomfort, distraction or a reduction in the ability to see essential information. Lighting organizations have sought to establish limits for stray light in each environmental lighting zone. If these criterion limits are not exceeded, it implies that a majority of a population of normal viewers would find the impact unobjectionable.

To assess the impact of prospective new lighting, hypothetical designs were created for staging areas, sub-station yards, tunnel roadways, and converging and diverging freeway ramp lighting. Using commercially available lighting software, the location of criterion limits was calculated for light trespass, glare, sky glow and surface brightness for each situation. The viewshed was then examined to see if any observer would likely be found in such locations.

Temporary lighting installations such as the use of generator mounted floodlighting and site lighting for construction staging areas are most apt to generate adverse lighting impacts because of the lack of well defined application standards. The use of inappropriate lighting equipment and the improper placement and aiming of lighting units could result in the production of light trespass, glare, artificial sky glow, and extreme surface brightness.

Figure 2.1.6-37 Environmental Lighting Zones



The issue of light trespass at construction staging sites was examined by calculating the illumination falling upon the nearest façade of the Parkwoods Condominiums. The lighting model included a 9 meter (29.5 feet) high temporary soundwall along Caldecott Lane between the staging area and residential development. The maximum vertical illuminance achieved is 5.54 Lux[9] (0.51 foot-candles), which does not exceed criterion levels for light trespass in the environments of Lighting Zone LZ3 but does exceed criterion levels for trespass in Lighting Zone LZ2, east tunnel landscape unit. Although the potential for light trespass is greater at the east tunnel landscape unit, there are no properties in the immediate proximity of the east portal staging area that would suffer trespass and require mitigation. Except for the Parkwoods Condominiums, all other properties are located at significantly greater distances from the west portal staging area and since the illumination received is an inverse function of the square of the distance to the source, the illuminance on other properties is deemed inconsequential.

Under the same hypothetical lighting model, the level of glare directed to a point of greatest lighting intensity on the Parkwoods Condominiums was determined to be 2.135 Lux, which is well below the criterion level for glare in environmental zone LZ3 and also below the criterion level for glare in environmental zone LZ2.

Human-made or artificial skyglow is the result of a high proportion of light emitted above the horizontal plane and being reflected by particulate matter in the atmosphere. Unshielded, non-cutoff, exposed refractor luminaries and broad beam, general purpose flood light luminaries that are typically used for construction site lighting contribute significantly to artificial sky glow and would generally exceed the criterion limit for environmental zones LZ2 and LZ3 respectively. Their use should be limited except where their specific photometric attributes are warranted.

The construction staging areas when illuminated would acquire surface brightness as a function of the reflectance of its surfaces and the intensity of the illumination received by the surfaces. The luminance of hypothetical staging area as calculated using commercially available lighting software produced a higher luminance at the most active portions of the staging areas which would be considered obtrusive in zone LZ2 (east portal staging area) but acceptable in zone LZ3 (west portal staging area). The average luminance at the west end and mid-section of the west portal staging area would be below the criterion level for either zone LZ2 or LZ3. The higher levels of nighttime illumination carry a greater risk of generating unacceptable surface brightness and that consideration needs to be given to the reflective nature of the materials used for paving and architectural construction materials.

Permanent lighting installations, based on contemporary recommended lighting practice will not produce negative impacts for light trespass, glare or surface brightness in either the West or East Viewshed. Artificial skyglow could exceed maximum recommended limits for environmental lighting zone LZ2 or LZ3 if non-shielded, non-cutoff luminaries are used in the design.

Because lighting impacts are either transient or because they are below criterion levels for adverse effects on the visual environment, the impact for installed lighting is considered to be less than significant.

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[9] A measure of illuminance in lumens per square meter. One lux equals 0.093 footcandle.

2.1.6.5 AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

Avoidance, minimization and mitigation measures would be implemented in accordance with the Department's standards and recommendations for visual impacts, as suggested by the Department's Highway Design Manual. These measures include:

- Vines and/or shrubs would be planted to cover or completely screen views of new soundwalls and retaining walls constructed as part of this project;
- The new OMC would be designed with Art Deco features and have exterior colors and textures to match the existing and new tunnel portals;
- Soundwalls and retaining walls would be designed with Art Deco features to complement the existing and new tunnel portal structures;
- Soundwalls would be designed with surface texture and stain to enhance the rural character of the corridor to blend with existing facilities;
- Areas where vegetation is removed for project construction shall be revegetated with similar types of tree and shrub species. Areas of particular concern for revegetation include the hillsides surrounding the new tunnel portal and the area between State Route 24 and Caldecott Lane; and
- Existing oak trees in areas affected by project construction shall be replaced with No. 15 (15-gal) size oak trees of same or approved species at a 5:1 ratio.

Implementation of these mitigation measures would reduce the adverse visual effects of the build alternatives.

2.1.6.6 CONSISTENCY WITH SCENIC/VISUAL RESOURCE PLANS AND POLICIES

The General Plans for Alameda and Contra Costa counties and the cities of Oakland, Orinda and Berkeley set forth scenic/visual resource goals and policies intended to preserve, enhance, restore and respect scenic vistas and visually important landscapes in each jurisdiction. The proposed project would be generally consistent with relevant scenic/visual resources policies, or mitigation would be applied to make it consistent.

2.1.7 Cultural Resources

The information presented in this section is taken from the technical reports, *Historic Property Survey Report* (Jones and Stokes, 2005) and *A Finding of No Adverse Effect* (Jones and Stokes, 2005).

2.1.7.1 REGULATORY SETTING

"Cultural resources" as used in this document refers to all historical and archaeological resources, regardless of significance. Laws and regulations dealing with cultural resources include the following:

The National Historic Preservation Act of 1966 (NHPA), as amended, sets forth national policy and procedures regarding historic properties, defined as districts, sites, buildings, structures, and objects included in or eligible for the National Register of Historic Places (NRHP). Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings on such properties and to allow the Advisory Council on Historic Preservation the opportunity to comment on those undertakings, following regulations issued by the Advisory Council on Historic Preservation (36 CFR 800). On January 1, 2004, a Section 106 Programmatic Agreement (PA) among the Advisory Council, FHWA, State Historic Preservation Officer (SHPO), and the Department went into effect for Department projects, both state and local, with FHWA involvement. The PA incorporates the requirements of the Advisory Council's regulations, 36 CFR 800, streamlining the Section 106 process and delegating certain responsibilities to the Department.

Historic properties may also be covered under Section 4(f) of the U.S. Department of Transportation Act, which regulates the "use" of land from historic properties. See Appendix B for specific information regarding Section 4(f).

Historical resources are considered under the California Environmental Quality Act (CEQA), as well as California Public Resources Code (PRC) Section 5024.1, which established the California Register of Historical Resources. PRC Section 5024 requires state agencies to identify and protect state-owned resources that meet National Register of Historic Places listing criteria. It further specifically requires the Department to inventory state-owned structures in its rights of way. Sections 5024(f) and 5024.5 require state agencies to provide notice to and consult with the SHPO before altering, transferring, relocating, or demolishing state-owned historical resources that are listed on or are eligible for inclusion in the National Register or are registered or eligible for registration as California Historical Landmarks.

2.1.7.2 AFFECTED ENVIRONMENT

A *Historic Property Survey Report* (HPSR), including an *Archaeological Survey Report* (ASR) for this project was completed in January 2005.

The Department's efforts to identify cultural resources were documented in the HPSR. A study area or Area of Potential Effects (APE) for the proposed project was defined and was based on the proposed project footprint and the total right-of-way width (existing and proposed). The archaeological APE encompasses all areas where project-related ground disturbance would occur, including the maximum right-of-way that would be acquired for roadway widening, fill, excavation, construction easements, staging areas, access routes, potential utility relocation, and potential noise barriers (which could include soundwalls, earthen berms, or a combination of berms and walls). The architectural APE (see Figure 2.1.7-1) includes, in addition to the archaeological APE, two parcels adjacent to the roadway right-of-way and on which structures are located. Both the archaeology and architectural history APEs are limited to areas of direct impact where non-state owned parcels are unimproved and contain no buildings or structures. The Caldecott Tunnel extends on an underground easement up to 190 meters (623 feet) below non state-owned lands. The APE does not include these non state-owned lands above the easement.

Archaeological Resources

The ASR found that no previously recorded archaeological resources were identified within or adjacent to the project area, and no archaeological resources were identified as a result of the field survey. Due to the highly disturbed nature of the APE and the general topography of the APE, including area with steep slopes, there appears to be a low potential for the proposed project to impact buried archaeological resources or for the discovery of new archaeological resources.

Two records searches were conducted for the proposed project, at the Northwest Information Center (NWIC) of the California Historical Resources Information System, located at California State University, Sonoma. The search records housed at the NWIC were specific to the project area and a surrounding 1-mile wide area. The first record search took place on September 21, 2001 and a second search was conducted on May 10, 2004, which also included a 1-mile radius of the project area.

The National Register of Historic Places (NRHP), the California Register of Historical Resources (CRHR), the California Inventory of Historic Resources (1976), California Historical Landmarks (California Department of Parks and Recreation, 1966), California Points of Historical Interest (May 1992 and updates), historical maps, and secondary historical writings were also consulted.

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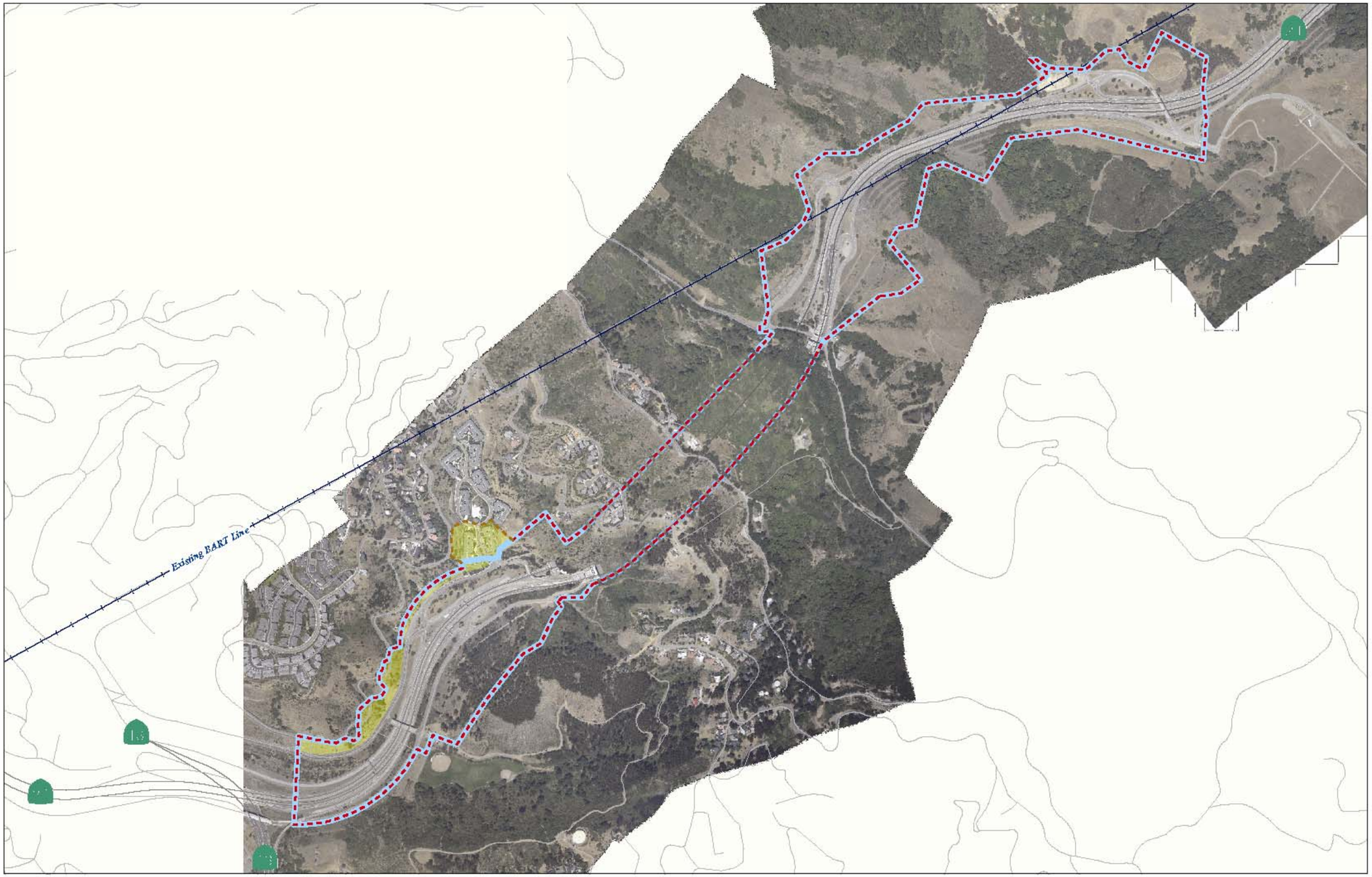
Figure 2.1.7-1 Area of Potential Effects



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The National Register of Historic Places (NRHP), the California Register of Historical Resources (CRHR), the California Inventory of Historic Resources (1976), California Historical Landmarks (California Department of Parks and Recreation, 1966), California Points of Historical Interest (May 1992 and updates), historical maps, and secondary historical writings were also consulted.

The Native American Heritage Commission (NAHC) was contacted on May 12, 2004, with a description and location of the proposed project and requested contact information for Native American representatives who might have interest in the proposed undertaking. A request was also made for NAHC to consult their inventory to determine if any sacred lands were located in or near the project area. A response from NAHC was received on May 20, 2004, indicating that their sacred lands database search was negative. On May 24, 2004 letters were sent to the following Native American contacts based on the list provided by the NAHC:

1. Ms. Ella Rodriguez, Ohlone/Esselen
2. Ms. Irene Zwierlen, Chairperson, Amah/Mutsun Tribal Band
3. Jakki Kehl, Ohlone
4. Katherine Perez, Ohlone/Costanoan/Northern Valley Yokut/Bay Miwok
5. Joseph Mondragon, Tribal Administrator, Amah/Mutsun Tribal Band
6. Melvin Ketchem III, Environmental Coordinator, Amah/Mutsun Tribal Band
7. Michelle Zimmer, Cultural Resources Coordinator, Amah/Mutsun Tribal Band
8. Howard Soto, Ohlone, CNA Cultural Resource
9. Ann Marie Sayers, Chairperson, Indian Canyon Mutsun Band of Costanoan
10. Andrew Galvan, The Ohlone Indian Tribe
11. Ramona Garibay, Representative, Trina Marine Ruano Family

Responses were received from Joseph Mondragon and Ann Marie Sayers. Mr. Mondragon acknowledged that had there once been Native American resources in the APE, they have likely already been disturbed by previous construction. Mr. Mondragon and Ms. Sayers requested that if any Native American remains are encountered that the NAHC be contacted.

Built/Architectural Resources

The HPSR prepared for the project found that the project APE includes one property (the original two bores of the Caldecott Tunnel) that is eligible for listing in the NRHP. This state-owned property was recorded and evaluated under the provisions of California Public Resources Code (PRC) Section 5024 in a Historic Resources Evaluation Report (HRER) prepared by the Department in 1995. It was concluded that the two original 1937 tunnel bores, portal buildings, and approaches appeared to meet the criteria for listing in the NRHP. The two original bores and portals of the Caldecott Tunnel are historically significant for their role in the development of the East Bay: the tunnels provided a crucial link connecting eastern Contra Costa County with Alameda County and providing a commuting route from Contra Costa County to Oakland and San Francisco, thus stimulating the rapid growth of Contra Costa County. The historic Caldecott Tunnel is also significant as an achievement of civil engineering and is associated with the work of two master designers, Henry H. Meyers and George A. Posey. This property is also eligible as a historical resource for the purposes of CEQA, using the criteria outlined in Section 5024.1 of the California Public Resources Code. The HRER noted above also determined that the third bore and associated structures, built in 1964, were not eligible for listing in the NRHP. The SHPO concurred with this finding in a letter dated April 8, 1998.

Two non-state owned parcels within the architectural history APE contain buildings or structures that were constructed less than 50 years ago. These properties are exempt from evaluation in accordance with the PA. The APE also includes six state-owned bridges. All six structures are not eligible for listing in the National Register according to the 1986 Caltrans Bridge Inventory and updates.

2.1.7.3 EFFECTS

The Department, on behalf of the FHWA, submitted a Finding of No Adverse Effect to the SHPO in February 2005. This report evaluated the potential effects of the Caldecott Tunnel Improvement Project (fourth bore) on the historic property, the original two Caldecott tunnels, portals buildings, and approaches, in accordance with the Criteria of Adverse Effect (36 CFR 800.5). In general, an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. The Finding of No Adverse Effect Report concluded that the undertaking, either the two-lane or three-lane north alignment alternatives, could have an effect on the historic property, but that the effect would not be adverse. The project will not result in the physical destruction, alteration, or removal of the historic Caldecott Tunnel. The setting around the historic tunnel bores and associated portals has been steadily encroached on by development since 1937, including the construction of the third bore in 1964. Although the proposed project would represent a change to the property's setting near each end of the tunnel, no physical features important to the Caldecott Tunnel's historical significance within the historic property's setting would be altered.

The SHPO concurred that the project would have no adverse effect to the historic property in March 2005 (see Appendix H). The finding of no adverse effect also satisfies the Department's responsibilities under PRC 5024.5(a).

2.1.7.4 AVOIDANCE, MINIMIZATION AND/OR MITIGATION MEASURES

Additional archaeological surveys will be required if project plans are changed to include previously unsurveyed areas. Due to the very low archeological sensitivity of the APE, it is the Department's position that a Native American monitor will not be necessary during construction activities. If buried cultural materials are encountered during construction, it is the Department's policy that work will stop in that area until a qualified archaeologist can evaluate the nature and significance of the find.

If human remains are discovered, State Health and Safety Code Section 7050.5 states that further disturbances and activities shall cease in any area or nearby area suspected to overlie remains, and the County Coroner will be contacted. Pursuant to Public Resources Code Section 5097.98, if the remains are thought to be Native American, the coroner will notify the NAHC who will then notify the Most Likely Descendent (MLD). At this time, the person who discovers the remains would contact the Department's District 4 Office of Cultural Resources so that they may work with the MLD on the respectful treatment and disposition of the remains. Further provisions of PRC 5097.98 are to be followed as applicable. Record searches conducted for the project in September 2001 and May 2004 found no historic or prehistoric archaeological sites that have been recorded within the APE or within the one-mile radius of the APE. The APE does include one property that was previously determined eligible for listing in the National Register, the Caldecott Tunnel. According to a 1995 HRER prepared by the Department, the contributing features of the historic cultural resource known as the Caldecott Tunnel include the two parallel reinforced concrete two-lane tunnels (tunnels # 1 and # 2); two portal building containing ventilation equipment as well as office, shops, and storage spaces; and the approaches for the tunnels that were completed in 1937. This property will not be affected by either the two-lane or three-lane north alignment alternatives.