Chapter 2 Affected Environment, Environmental Consequences, and Mitigation Measures

2.1 Human Environment

2.1.1 Land Use Characteristics

This section identifies existing regional land use and area plans and policies that apply to lands along SR 4. A land use study area was identified, consisting of all properties contiguous to SR 4 within the project limits. Existing land uses in the study area are shown in Figure 2.1.1-1. The proposed project is located in Contra Costa County, extending eastward along SR 4, from just west of Loveridge Road in the City of Pittsburg to SR 160 in the City of Antioch.

2.1.1.1 Major Land Uses

Existing land uses in the vicinity of the SR 4 (East) Widening Project include commercial, institutional, single- and multi-family residential, and industrial as described from west to east below.

In the western segment of the SR 4 corridor, from the Harbor Street overcrossing to the SR 4 / Loveridge Road Interchange in Pittsburg, existing land use is light industrial and commercial to the south of SR 4 and mostly residential with some commercial uses to the north. After SR 4 crosses Kirker Creek, land use transitions to *institutional*, *commercial*, and light industrial uses located on both the south and north sides of the roadway. The Floor Store and a self-storage business are located in the southwest quadrant of the SR 4 / Loveridge Road Interchange.

North of SR 4 between the Loveridge Road Interchange in Pittsburg and the utility corridor commonly known as Standard Oil Avenue, existing land uses are a mix of commercial (retail) and light industrial. North of SR 4 between Standard Oil Avenue and the United States Bureau of Reclamation (USBR) right-of-way commonly known as the Los Medanos Wasteway, the existing land uses contiguous to Century Boulevard are a mix of vacant land and commercial.

Land uses to the south of SR 4 between Loveridge Road and Somersville Road *are a mix of commercial (retail and service), high density residential (apartments), and institutional.* Land uses include a motel, light industrial businesses and the Pheasant Ridge Apartments. Los Medanos College is located on *the south side of East Leland Road in Pittsburg.*

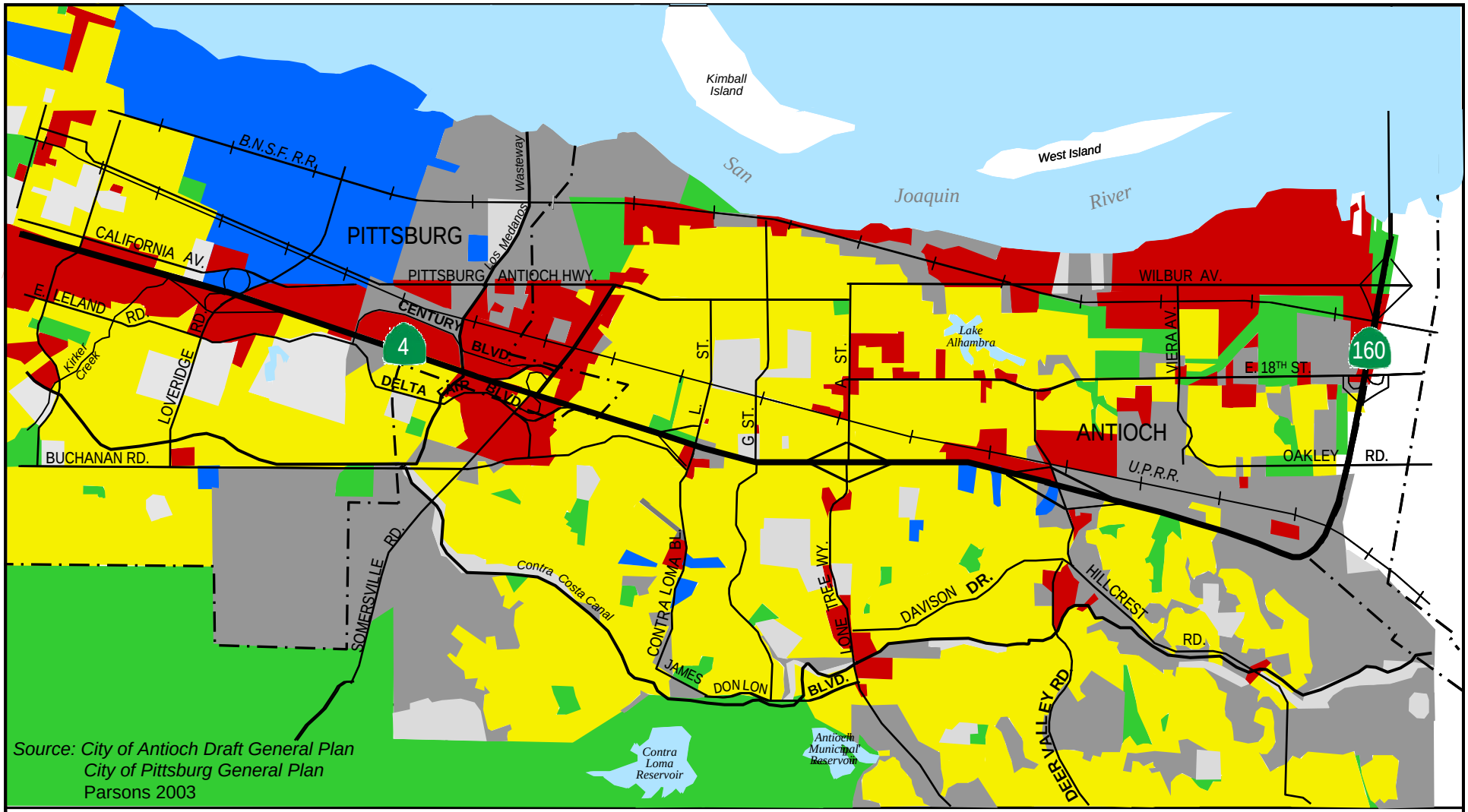


Figure 2.1.1-1

STATE ROUTE 4 (EAST) WIDENING PROJECT: LOVERIDGE ROAD TO STATE ROUTE 160
04-CC-4-KP 37.9/R46.3 (PM 23.5/R28.8)

EXISTING LAND USE

North of SR 4 between the Los Medanos Wasteway and Somersville Road, the existing land uses contiguous to Century Boulevard are commercial (retail and service). Between Century Boulevard and the Los Medanos Wasteway, land uses to the south are primarily residential and undeveloped properties. The Delta View Apartments, Kaiser Hospital, County East Mall, a bowling alley and a motel are located east of the Los Medanos Wasteway and south of SR 4. Undeveloped utility properties are predominant north of the roadway from Century Boulevard to Somersville Road.

Single-family residential uses are located along both sides of SR 4 between Somersville Road and the SR 4 / Contra Loma Boulevard–L Street Interchange. A motel and commercial uses are located, respectively, in the northeast and southeast quadrants of the SR 4 / Somersville Road Interchange.

Single- and multi-family residential uses are located along both sides of SR 4 between the SR 4 / Contra Loma Boulevard–L Street and SR 4 / G Street Interchanges. The Casa Blanca Apartments and a gas station are located in the northeast and southwest quadrants of the SR 4 / Contra Loma Boulevard–L Street Interchange. East of G Street, land use on both sides of SR 4 is predominantly single-family residential with some commercial uses in the southwest quadrant of the SR 4 / Lone Tree Way–A Street Interchange.

Single-family residences are predominant along both sides of the roadway between the SR 4 / Lone Tree Way–A Street Interchange and the Cavallo Road undercrossing. Commercial uses are located in the northeast quadrant of the SR 4 / Lone Tree Way–A Street Interchange. East of Cavallo Road, land uses south of SR 4 continue to be mostly single-family residential with some multi-family residential uses. North of the roadway, land uses are primarily light industrial between Cavallo Road and Hillcrest Avenue. The Hillcrest Plaza shopping center is located in the northwest quadrant of the SR 4 / Hillcrest Avenue Interchange.

Between the SR 4 / Hillcrest Avenue Interchange and the eastern project limit, just west of SR 160, land use south of SR 4 is mostly single-family residential. Undeveloped commercial and residential properties are located near the SR 4 / Hillcrest Avenue and SR 4 / SR 160 Interchanges, respectively. The Hillcrest park-and-ride lot is located in the northeast quadrant of the SR 4 / Hillcrest Avenue Interchange. Land use north of SR 4 in this segment is entirely undeveloped industrial land.

2.1.1.2 Developable Land and Development Trends

Based on the Association of Bay Area Governments' (ABAG) *Projections 2003*, Contra Costa County is anticipated to gain 115,771 households between 2000 and 2030. During this forecast period, East County, including Pittsburg and Antioch, will dominate the county's growth. The Pittsburg area will have the second highest growth in Contra Costa County, adding *13,839* households during this period. The City of Antioch will rank third in growth rate with approximately 12,300 households added between 2000 and 2030. Overall, Contra Costa County jurisdictions do not have adequate residential land to accommodate ABAG's projected household growth.

The City of Pittsburg has a substantial inventory of residential properties with development approvals, as well as several planned commercial and industrial complexes. Development trends and growth projections consistent with the *City of Pittsburg 2020 General Plan* would result in approximately 29,300 total housing units within the city limits, with an estimated population of 83,600. The majority of residential growth is planned for the southern subareas of Pittsburg. Buildout of all commercial and industrial sites within the City of Pittsburg would result in approximately 808,000 square meters (m^2) [8.7 million square feet (ft^2)] of commercial space and 678,000 m^2 (7.3 million ft^2) of industrial space. This increase in non-residential building area would result in a total of 31,800 commercial jobs and 8,100 industrial jobs.

The *City of Antioch General Plan* projects approximately 11,000 new housing units within the city limits, both in single- and multi-family developments, for a total residential development capacity of about 41,000 housing units. The *General Plan* indicates that buildout of commercial, office and industrial sites within the City of Antioch would result in approximately 465,000 m^2 (5.0 million ft^2) of commercial uses, 93,000 m^2 (1.0 million ft^2) of office uses and 1,654,000 m^2 (17.8 million ft^2) of industrial uses.

2.1.1.3 Jobs/Housing Balance

The significance of a jobs/housing balance is based on the premise that when sufficient jobs are available locally to meet the employment needs of the local resident base, then commute traffic and congestion to and from jobs outside the local area will be reduced. If the local job market exceeds the number of affordable houses in the area, then persons working locally will tend to commute from outlying areas where housing is available. Other factors bearing on where people live and work include vacancy rates, job types, income, the quality of available schools, and personal choice of whether to live and work in the same locale.

Projections for East County indicate that the subarea will have more employed residents than jobs in the coming years, suggesting that increasing numbers of residents may have to commute to jobs elsewhere, further exacerbating existing traffic conditions. In 2000, the City of Pittsburg had over twice as many residents as available jobs, with a deficit of approximately 10,000 jobs. In the last five years, however, the city has added jobs at a faster rate than population with the implementation of several large-scale commercial developments. In 2000, the City of Antioch had 43,811 employed residents and only 17,060 total jobs. This jobs/housing trend is projected to continue through 2030.

2.1.1.4 Land Use Planning Goals and Policies

Land use for the study area is guided by the Contra Costa County General Plan, the City of Pittsburg General Plan and the City of Antioch General Plan.

***Contra Costa County General Plan*.** Primary goals of the Land Use Element of the *County General Plan*, adopted in July 1996, are 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. Another goal of the *County General Plan* is to adopt and implement an innovative Countywide

Growth Management Program that effectively links land use policy with transportation and other infrastructure improvements.

Two transportation policies within the Land Use Element of the *County General Plan* relate directly to the proposed project, as follows:

- Improve existing interchanges and establish new interchanges over SR 4 by developing plans in coordination with Caltrans and the Cities of Pittsburg, Antioch and Brentwood; and
- The County shall encourage the expansion of regularly scheduled transit service and express bus service to urbanizing areas east of Antioch.

City of Pittsburg General Plan. Adopted in August 2001, the *Pittsburg 2020 General Plan* is oriented toward physical development of land uses, a circulation network, preserving open space, and supporting facilities and services. Sites are to be reserved along SR 4 at the Willow Pass Road/San Marco Boulevard and SR 4 / Loveridge Road Interchanges for business commercial development.

Under the Goals of the Street System and Traffic Standards section of the General Plan, it was noted to work with Caltrans and CCTA to achieve timely construction of programmed freeway and interchange improvements. General Plan policies for highways and arterial streets support Caltrans planned improvements to the SR 4 / Railroad Avenue and SR 4 / Loveridge Road Interchanges in conjunction with SR 4 widening projects. The City of Pittsburg endorses working with federal, state and regional authorities to ensure timely completion of the projects needed to adequately serve local circulation needs.

City of Antioch General Plan. As stated in the *General Plan*, November 2003, the overall land use goal for the City of Antioch is to provide for a high quality of life and ensure that new development occurs in a logical, orderly, and efficient manner.

Individual land use goals for the City of Antioch include:

- Maintaining a pattern of land uses that minimizes conflicts between various land uses, and promotes rational utilization of presently undeveloped and underdeveloped land, and supports the achievement of Antioch's vision for its future;
- To establish a land use mix that serves to develop Antioch into a balanced community in which people can live, work, shop, and have recreation without needing to leave the City; and
- To establish an overall design standard for the City of Antioch.

The City of Antioch endorses working with Caltrans, County and other local jurisdictions to expand and upgrade freeway facilities in East Contra Costa County to accommodate projected future traffic levels.

2.1.1.5 Land Use Impacts

This section describes the changes in land use that would occur as a result of the project alternatives. Implementation of the No-Build Alternative would have no long-term effect on land uses in the project area, and the location and characteristics of transportation facilities and uses would not change.

Under the Build Alternative, land use changes would be associated with the acquisition of property for modifications to existing transportation facilities and construction of new facilities. A summary of these land use changes is provided in Table 2.1.1-1 below.

Table 2.1.1-1: Estimated Land Use Changes as a Result of the Build Alternative

Land Use Converted	Total Area Converted	
	Hectares	Acres
Residential to Transportation	1.54	3.80
Industrial to Transportation	0.08	0.19
Commercial to Transportation	6.20	15.32
Vacant or Other to Transportation	5.12	12.65
TOTAL	12.94	31.96

Source: Parsons 2003

2.1.1.6 Consistency with Plans, Goals and Policies

Plans, goals and policies of Contra Costa County and the cities of Pittsburg and Antioch that are relevant to the proposed project were summarized in Section 2.1.1.4, Land Use Planning Goals and Policies. The SR 4 (East) Widening Project is consistent with local planning goals and policies that have been identified in local regional plans and studies. The project Build Alternative would be consistent with the stated objectives of these jurisdictions for improvements to the existing SR 4 corridor; however, the No-Build Alternative would not support achievement of these goals. As set forth in the Land Use Element of the *Contra Costa County General Plan*, the SR 4 (East) Widening Project is consistent with policies to improve existing interchanges and widen structures over SR 4 by developing plans in coordination with Caltrans and the Cities of Pittsburg, Antioch and Brentwood.

2.1.2 Growth Inducement

The California Environmental Quality Act (CEQA) specifically requires that an analysis and discussion of the growth inducement impacts of the project be included as part of an environmental document. The growth inducement assessment examines 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 a project to facilitate or accelerate growth beyond planned developments, or induce

growth to shift from elsewhere in the region. The project's influence on area growth is 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 growth inducement analysis for the present project estimated the effect that the Build and No-Build Alternatives would have on development in the project area in terms of growth pressures, the reasons for the anticipated effects, and whether or not the effect would be substantial in terms of consistency with local and regional plans.[1]

To select residential areas to be analyzed, growth factors such as cost of housing, commute time from residential areas to major employment centers, and the type of growth planned for the residential areas as described in the land use plans for the cities near the project area, were reviewed. Based on this review, four residential zones, designated as zones R-1 to R-4, were selected to represent growth in the project area. R-1 is an agricultural conservation area to the south of Brentwood, very close to the SR 4 Bypass, where very low development is planned. R-2 is an area in Oakley, marked for 'Agricultural Limited' land use. R-3 is an area in Brentwood, close to SR 4, and slated for moderate to high development. R-4 is an area in Antioch that is also scheduled for moderate to high development. Each zone is represented by the center of activity of the zone, the centroid. Figure 2.1.2-1 shows the location of the residential centroids.

The major employment areas in the Bay Area were grouped into 11 zones, represented by employment centroids, E-1 to E-11. Three centroids denote the employment in and near the project area, while nine centroids denote the employment in rest of the Bay Area. Figure 2.1.2-2 shows the location of the employment centroids while Table 2.1.2-1 presents the population and employment for residential zones and employment zones in 2030.

Commute time was considered the primary factor affected by the proposed project; therefore peak hour commute time was calculated for trips between each residential centroid and the 11 employment centroids for the Build and No-Build condition. The analysis found that commute time savings created by the proposed alternatives would not be sufficient to offset other factors in residential location decisions. The maximum time savings achieved through implementation of this project would be only about six minutes, while the estimated trip time between residential zones and most jobs is roughly one to two hours.

An analytical growth model was then applied that uses access to jobs as its prime variable.[2] This model provided three growth pressure indices for each residential zone. These are the indices for planned growth, unconstrained growth[3] and constrained growth[4]. A summary of the results for the unconstrained and constrained analyses is provided in Table 2.1.2-2. Overall, the growth inducement

[1] The information presented herein is taken from *Growth Inducement Study - State Route 4 (East) Widening Project: Loveridge Road to State Route 160 (Parsons, 2003).*

[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.

[3] An index which gives the attractiveness of a residential area based on commute time from the area, regardless of planned capacity of the area.

[4] An index which gives the attractiveness of a residential area based on commute time from the area, while taking into consideration the planned growth for the area.

indices for the Build Alternative are very similar to those for the No-Build Alternative. Therefore the analysis shows that the residential growth pressures that occur within the region are almost entirely independent of the proposed SR 4 East improvements.

Table 2.1.2-1: Residential and Employment Zones

Employment Zones		Employment - 2030
Label	**Areas included in the Employment Zone**	
E-1	Vallejo-Vacaville	204,676
E-2	Mill Valley -San Rafael	163,966
E-3	SF	1,042,987
E-4	San Mateo	299,266
E-5	Silicon Valley	1,389,805
E-6	Fremont-Oakland	751,798
E-7	Tri-Valley	292,144
E-8	Berkeley-Concord	482,406
E-9	West of Project Area	15,283
E-10	Project Area	41,090
E-11	East of Project Area	41,098
Total for the 11 Employment Zones		4,724,519
Total for the Bay Area		5,226,411
Residential Zones		**Population - 2030**
Label	**Location**	
R-1	Agricultural core just south of Brentwood	14,995
R-2	Area in Oakley	30,504
R-3	Area in Brentwood	15,668
R-4	Area in Antioch	10,195
Total for the Bay Area		8,780,333

Source: ABAG Projections, 2003; Parsons, November 2003.

On SR 4, absent capacity improvements, anticipated traffic queues would reach 17 kilometers (nearly 11 miles) in length westbound and 12 kilometers (nearly 8 miles) eastbound under 2030 travel demand. The westbound morning and evening peaks would overlap, and peak-period congestion would continue for fully 13 hours. Therefore, in reality, due to the build-up of bottlenecks and their corresponding reduction in roadway capacity, the section of SR 4 under consideration would actually be able to handle a much smaller percentage of traffic than the estimated 85 percent.

Table 2.1.2-2: Unconstrained and Constrained Growth Indices for Residential Zones

	R-1	R-2	R-3	R-4
Unconstrained				
No-Build	12.87%	33.96%	32.58%	20.59%
Build	13.54%	33.40%	30.96%	22.11%
Constrained				
No-Build	9.90%	53.15%	26.19%	10.77%
Build	10.50%	52.73%	25.10%	11.66%
Pop-Growth				
No-Build	21.01%	42.75%	21.96%	14.29%
Build	21.01%	42.75%	21.96%	14.29%
Source: Parsons, November 2003.				

2.1.3 Farmlands/Agricultural Lands

2.1.3.1 Setting

Existing land uses along the SR 4 corridor are primarily urban, as described in section 2.1-1, Land Use Characteristics. There are no agricultural resources in the project area.

2.1.3.2 Impacts

There are no farmlands in the project area; therefore, no farmland would be impacted by the project.

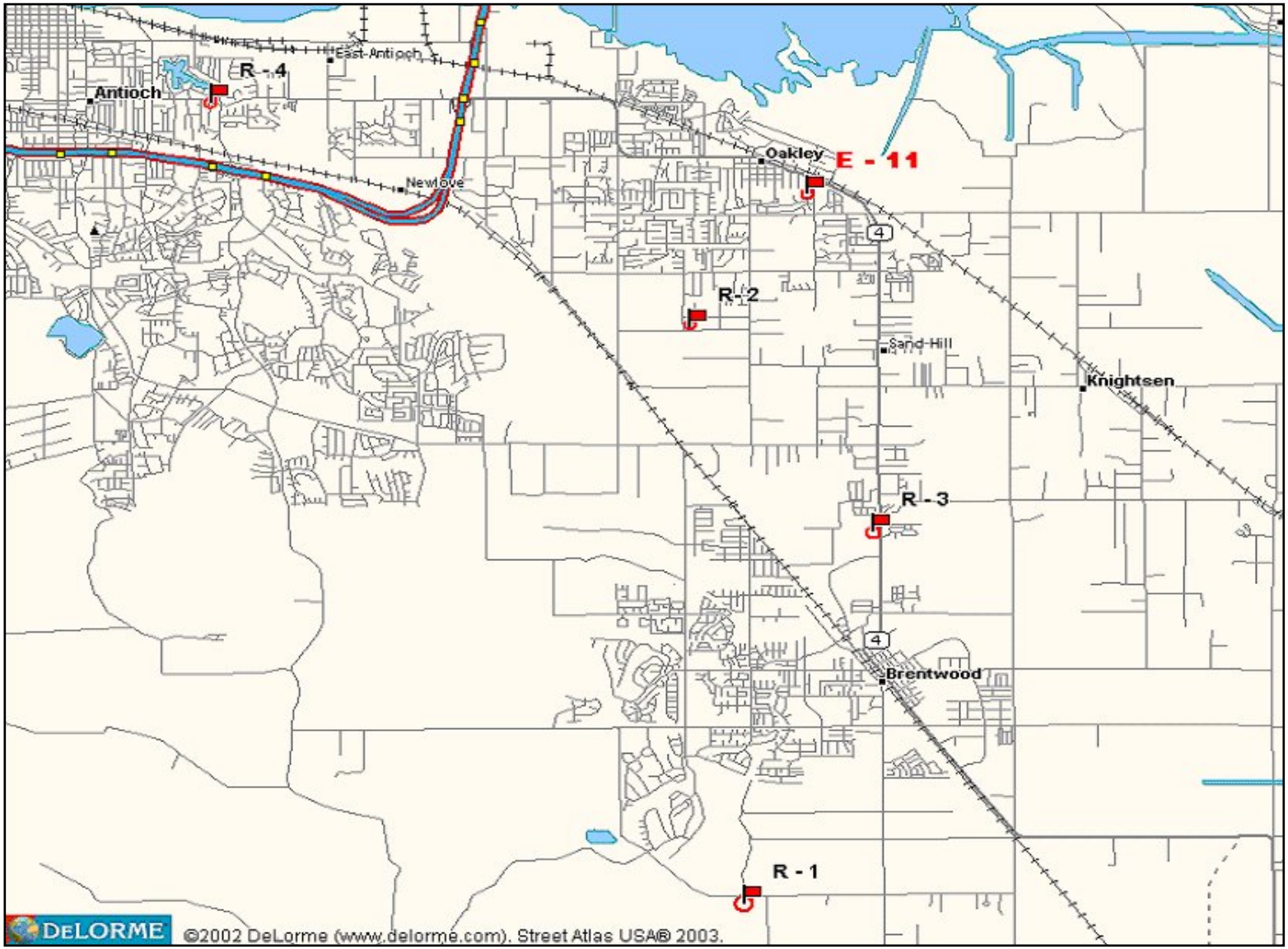


Figure 2.1.2-1

STATE ROUTE 4 (EAST) WIDENING PROJECT: LOVERIDGE ROAD TO STATE ROUTE 160
04-CC-4-KP 37.9/R46.3 (PM 23.5/R28.8)

LOCATION OF RESIDENTIAL CENTROIDS

N
NOT TO SCALE

Figure 2.1.2-2

STATE ROUTE 4 (EAST) WIDENING PROJECT: LOVERIDGE ROAD TO STATE ROUTE 160
04-CC-4-KP 37.9/R46.3 (PM 23.5/R28.8)

LOCATION OF EMPLOYMENT CENTROIDS

N
NOT TO SCALE

2.1.4 Community Impacts

2.1.4.1 Park and Recreational Facilities

Setting

In addition to the land use study area, a larger study area was defined for the purposes of describing socioeconomic characteristics and evaluating impacts on community facilities and residents. This community impacts study area consists of all census tracts touching on SR 4 within the project limits. It is the basis for the discussions in this and the following sections.

As listed in Table 2.1.4-1 and shown in Figure 2.1.4-1, there are 26 parks and recreational facilities within the community impacts study area, including the Contra Costa County Fairgrounds. Numbers on the table are keyed to locations shown on the figure. With the exception of the Fairgrounds, all these facilities are operated by the cities of Antioch's and Pittsburg's park and recreation departments.

Contra Loma Estates Park, located at Mahogany Way and Manzanita Way and shown as number 17 on Figure 2.1.4-1, is a five-acre neighborhood park that includes tennis courts, a tot play area, and a youth play area as well as landscaping for passive recreation. Contra Loma Estates Park lies along Route 4 east of Somersville Road and West of Contra Loma Boulevard/L Street. The City of Antioch Parks and Recreation Department, which is the agency of jurisdiction for the Contra Loma Estates Park, planned, laid out, and developed the park to provide for the future widening of SR 4. A strip of land approximately 550 by 50 feet wide along the back of the parcel on which the park is located has been reserved for freeway widening just south of an approximately 40-foot-wide strip of land reserved for utilities. These easements, shown in Figure 2.1.4-2, are excluded from the landscaping and other developed areas of the park and separated from the park areas by a landscape buffer. They are not developed or in use as park lands.

Impacts

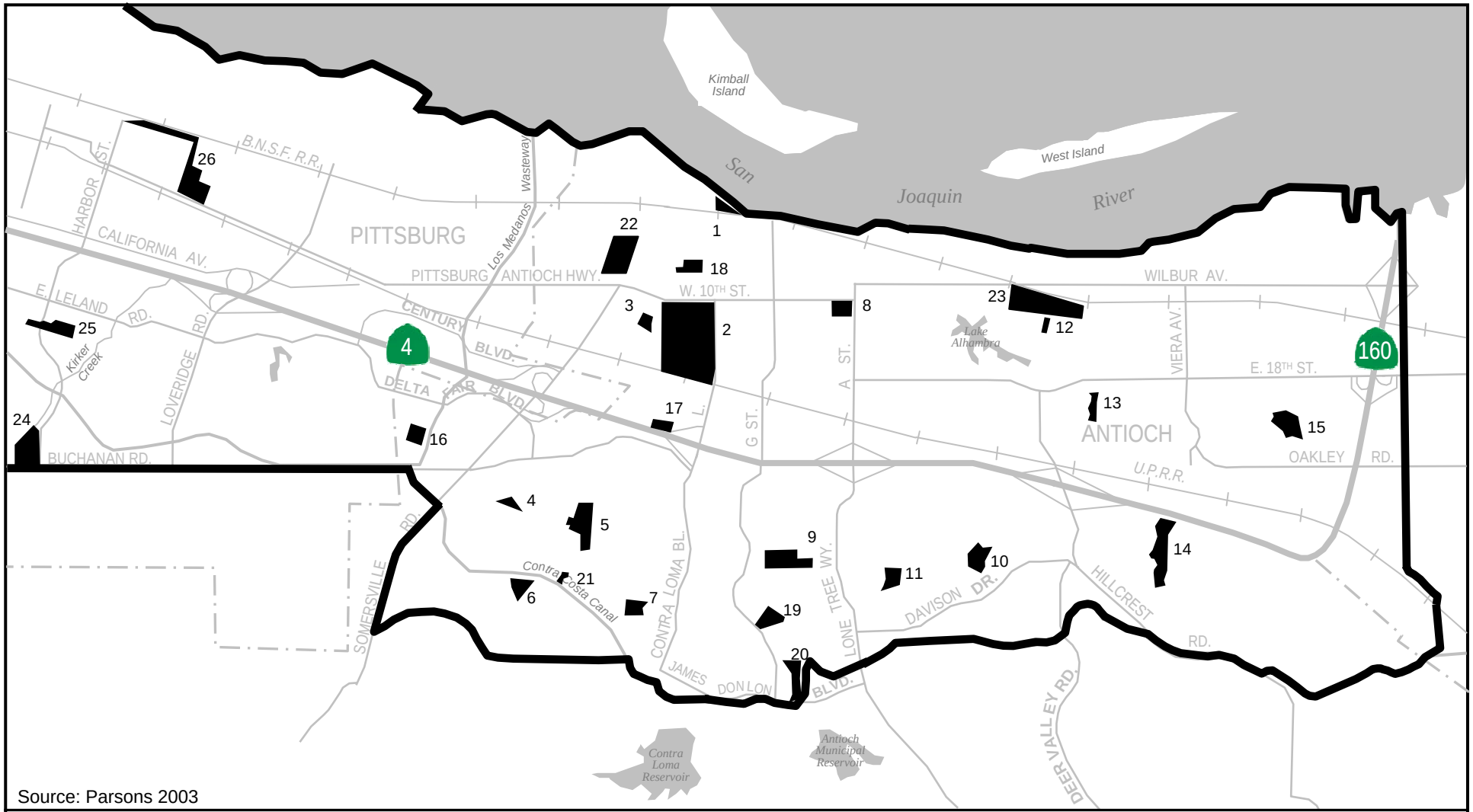
Widening SR 4 would use the strip of land on the freeway side of Contra Loma Estates Park that has been preserved for this purpose. In a letter dated August 16, 2004, the City of Antioch acknowledged that use of the 550- by 50-foot strip of land for freeway widening is consistent with the City's planning. (This letter is included in Section 3.3, Correspondence.) This use would have no effect on the remaining park lands or impair their recreation purposes or activities. Use of this strip of land would be consistent with prior planning because the land was set aside for freeway widening prior to development of the park.

Because the land in question is not developed, publicly accessible, or usable as park land, it is not protected under Section 4(f) of the Department of Transportation Act, and no Section 4(f) Evaluation has been prepared for this use.

Table 2.1.4-1: Existing Park and Recreational Facilities in the Study Area

No.	Name	Address/Location	Operated By
1	Barbara Price Marina Park	Foot of "L" Street	City of Antioch
2	Contra Costa County Fairgrounds	1201 West 10th Street, Antioch 94509	Contra Costa County
3	Fairview Park	Crestview and Aster Drives	City of Antioch
4	Village East Park	Gentrytown Drive and Melon Court	City of Antioch
5	Gentrytown Park	Carmana Way and Monterey Drive	City of Antioch
6	Canal Park	Gentrytown Drive and Curtis Drive	City of Antioch
7	Micra Vista Park	San Francisco Way and Hacienda Way	City of Antioch
8	Antioch City Park	10th and A Streets	City of Antioch
9	Memorial Park	D Street and Robert Street	City of Antioch
10	Harbour Park	Ashburton and Lindley Drives	City of Antioch
11	Mountaire Park	Sunset Land and Elmo Road	City of Antioch
12	Jacobsen Street Park	Wilber Ave. and Apollo Court	City of Antioch
13	Meadowbrook Park	Calaveras Circle	City of Antioch
14	Hillcrest Park	Larkspur and Sunflower Drives	City of Antioch
15	Almondridge Park	Almondridge Drive and Beechnut Street	City of Antioch
16	Gino Marchetti Park	Belle Drive and Kindree Street	City of Antioch
17	Contra Loma Estates Park	Mahogany Way and Manzanita Way	City of Antioch
18	Prosserville Park	Sixth Street and O Street	City of Antioch
19	Chichibu Park	Longview Road and Acorn Drive	City of Antioch
20	Sunny Ridge Park	James Donlon Boulevard and G Street	City of Antioch
21	Unnamed Park	Putnam Street and Jackson Place	City of Antioch
22	Babe Ruth Baseball Fields	1550 Somersville Road	City of Antioch
23	Gaylord Sports Field	Wilbur Avenue and Apollo Court	City of Antioch
24	Buchanan Park	Harbor and Buchanan Roads	City of Pittsburg
25	Small World Park	Harbor and Leland Road	City of Pittsburg
26	Central Park	Columbia Avenue and Pittsburg/Antioch Highway	City of Pittsburg

Source: Parsons 2003



Source: Parsons 2003

Legend:

Parks | City Boundary | Railroad | Study Area

N

NOT TO SCALE

Figure 2.1.4-1

STATE ROUTE 4 (EAST) WIDENING PROJECT: LOVERIDGE ROAD TO STATE ROUTE 160
04-CC-4-KP 37.9/R46.3 (PM 23.5/R28.8)

PARKS AND RECREATIONAL FACILITIES

Figure 2.1.4-2

STATE ROUTE 4 (EAST) WIDENING PROJECT: LOVERIDGE ROAD TO STATE ROUTE 160
04-CC-4-KP 37.8/R47.6 (PM 23.5/R29.6)

RIGHT-OF-WAY EASEMENT AT CONTRA LOMA ESTATES PARK

2.1.4.2 Relocation Impacts

Caltrans and CCTA will observe the rights and services provided under Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 in accordance with its own relocation assistance policies. It is Caltrans and CCTA policy that persons displaced as a result of highway programs shall receive fair and humane treatment and shall not suffer unnecessarily as a result of programs designed for the benefit of the public. A summary of relocation benefits is included in Appendix D.

The No-Build Alternative would not result in displacements of residential or nonresidential properties in the project area. The Build Alternative would result in both residential and nonresidential relocations. Table 2.1.4-2 summarizes the relocations impacts. A comprehensive description of relocation impacts is set forth in the *Draft Relocation Impact Report (DRIR)* prepared for this project.

Table 2.1.4-2: Residential and Nonresidential Relocation Under the Build Alternative

	Single Family Units	Mobile Homes	Multi-Family		Estimated Total Residential Units (Units/Residents)[1]	Nonresidential Units (Businesses/ Employees)
			Buildings	Units		
TOTALS	7	0	7	37	44/132	20/150

[1] Estimate of residents based on an average of 3.04 and 2.99 residents per unit (2000 U.S. Census Data, Tracts 3071.02 and 3080.01, respectively).
[2] Estimate of employees based on a visual survey of potentially affected parcels.
Source: Parsons 2003

Residential Displacement

Forty-four residential units would be subject to relocation under the Build Alternative, as shown in Table 2.1.4-2. This represents less than one percent of the total occupied dwelling units in the community impacts study area. All potential residential displacements would occur in the City of Antioch and are located on the north side of the SR 4 corridor near the SR 4 / Contra Loma Boulevard – L Street and SR 4 / Lone Tree Way – A Street interchanges. Construction of the SR 4 (East) Widening Project would acquire one multi-family residential building with 14 dwelling units at the SR 4 / Contra Loma Boulevard – L Street Interchange. Seven single-family residences and 10 multi-family buildings, with 23 dwelling units, would be displaced by project improvements proposed at the SR 4 / Lone Tree Way – A Street Interchange. Based on 2000 data for Census Tracts 3071.02 (3.04 persons/unit) and 3080.01 (2.99 persons/unit), approximately 132 residents would be relocated.

Assessed value ranges for the affected property types were obtained from current records of the Contra Costa County Tax Assessor's Office to indicate specific property values. These values are based on appraisals performed in 2003 and do not necessarily reflect the current worth of affected properties at the time of acquisition. Full appraisals to determine actual market value will be conducted for each property to be relocated based on current market conditions prior to acquisition.

The Build Alternative would displace an estimated 44 residential units in the City of Antioch. Assessed land values for the types of properties affected range from $10,989 to $122,400. Assessed structure values range from $13,730 to $161,262. The total net assessed value range is $32,329 to $239,292 with an average and median net value of $87,017 and $83,005, respectively.

Business Displacement

The estimated nonresidential relocations listed in Table 2.1.4-2 would be of commercial and service establishments. *Relocations would include a storage facility and a home remodeling service in the City of Pittsburg. Relocations in the City of Antioch would include two restaurants, a hotel, a water sports store, an automotive service center and a small business park (including two insurance companies, two cosmetic services, a home improvement service, a realtor, a travel agency, a ventilation service, an accounting service, a driving school, a non-profit agency, a wireless telephone service and a psychology service).* No heavy industrial operations, farmlands or public services have been identified for displacement by the Build Alternative.

Businesses identified for possible acquisition were subjected to a preliminary field survey to determine their general characteristics. Full assessment of all affected nonresidential uses will be conducted prior to their acquisition to determine their specific characteristics and values. The individual owners of all affected businesses will be interviewed prior to acquisition to determine the specific needs of each displacement.

The SR 4 (East) Widening Project would displace an estimated 20 nonresidential uses. Approximately 125 to 150 employees would be temporarily displaced by the project. The 2003 assessed net value of these displacements, including land and improvement values, ranges from $322,429 to $4.14 million, with an average assessed net value of $1.14 million and a median assessed net value of $805,318.

Relocation Resources

Current market data (November 2003) indicate that there are adequate resources in the cities of Antioch and Pittsburg to accommodate relocation of the displaced residential and nonresidential units. A full inventory of available relocation resources and a correlation with the units taken will be conducted and identified in the *Final Relocation Impact Report*.

2.1.4.3 Effects on Community Character and Cohesion

Community 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. There are a number of communities and neighborhoods adjacent to SR 4 and none would experience disruption in cohesion.

The proposed highway and interchange improvements would require both full and partial acquisition of residential and commercial properties along the SR 4 corridor within the community impacts study area. In instances of partial property takes, access would be maintained to avoid long-term effects to residents and communities.

Right-of-way acquisition requirements for the Build Alternative would affect residences in the neighborhoods on the north side of SR 4 near the SR 4 / Contra Loma–L Street and SR 4 / Lone Tree Way–A Street interchange areas. Residential displacements would occur on the periphery of these neighborhoods along the existing SR 4 right-of-way, which already forms a physical barrier in these communities. 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.

As summarized in Table 2.1.4-2, twenty businesses on both sides of the existing SR 4 right-of-way would likely need to be relocated. As described in section 2.1.4.2, Relocation Impacts, adequate relocation resources exist in the cities of Antioch and Pittsburg to accommodate relocation of these displaced businesses; therefore, these relocations are not expected to adversely affect the business community or neighborhood viability in these cities.

Additionally, the SR 4 (East) Widening Project would acquire sliver takes of an estimated 2.32 ha (5.73 ac) of commercial properties, 0.6 ha (1.38 ac) of vacant or other property, 0.3 ha (0.8 ac) of residential property and 0.1 ha (0.2 ac) of industrial property. These estimated acquisition requirements would primarily affect parking for some commercial businesses along the proposed right-of-way. As described in Section 2.1.6, Traffic and Transportation, two of the affected businesses would still have adequate parking as required by the standards of the Cities of Pittsburg and Antioch. Parking would be replaced or relocated at the other affected businesses.

2.1.4.4 Environmental Justice

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.

Environmental Justice Setting

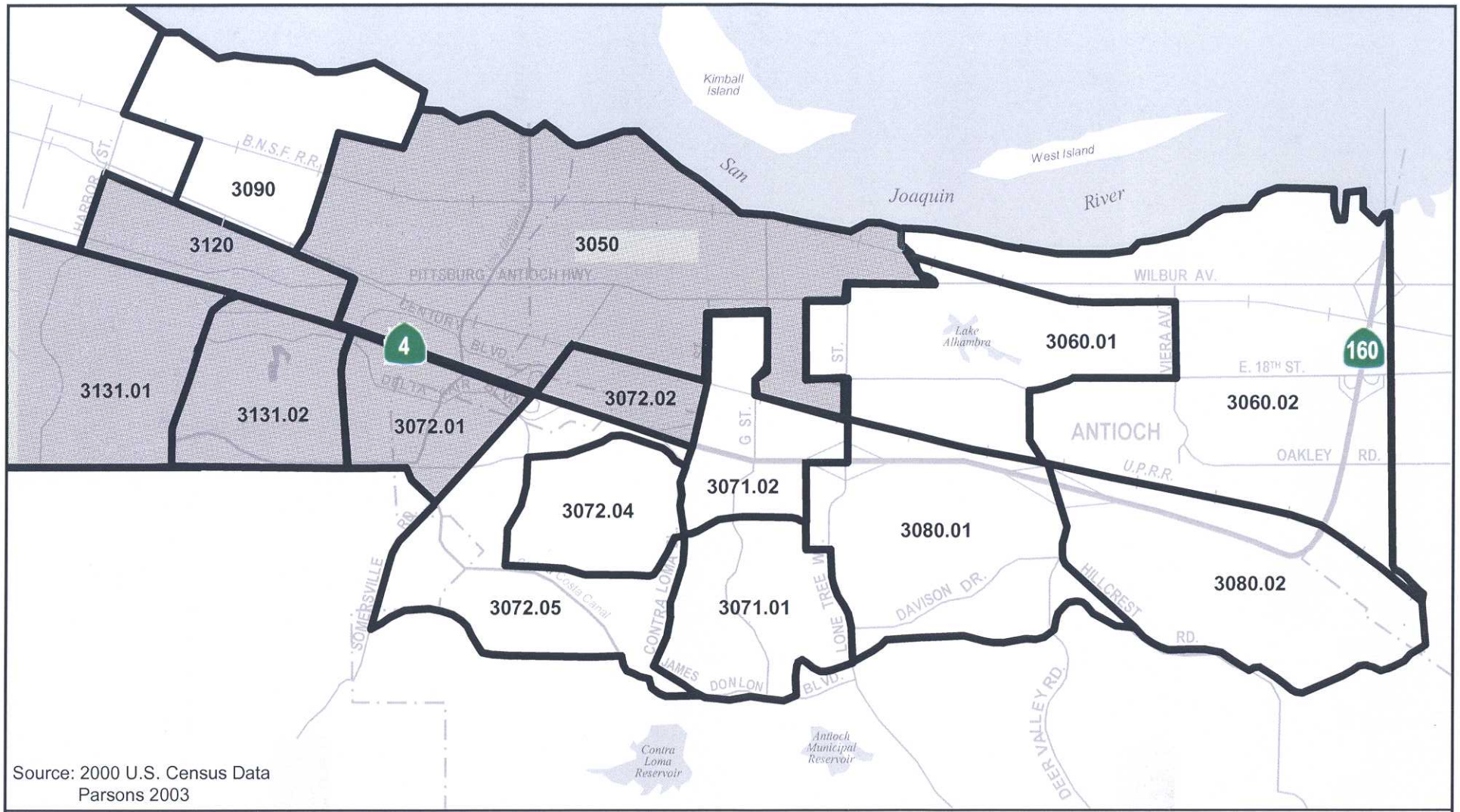
The project community impacts study area includes a variety of neighborhoods and a diverse, multi-ethnic population. The ethnic composition for the study area is comparable to Contra Costa County and the City of Antioch, whereas the City of Pittsburg is much more diverse. As shown in Table 2.1.4-3, approximately 47 percent of all community impact study area residents are members of minority groups. This compares to a 42 and 44 percent minority population in Contra Costa County and the City of Antioch, respectively. In the City of Pittsburg, 69 percent of the population is represented by minorities. Table 2.1.4-3 also shows that the percentage of persons below poverty level is higher for the community impact study area (approximately 12 percent) than for either Contra Costa County or the City of Antioch, but is comparable to that within the City of Pittsburg.

Table 2.1.4-3: Minority and Low-Income Populations in the Study Area

	Study Area	Contra Costa County	City of Pittsburg	City of Antioch
% Minority	47%	42%	69%	44%
% Low-Income	11.7%	7.5%	11.4%	8.5%

Source: 2000 U.S. Census data

Based on 2000 U.S. Census data for the study area, populations in 6 out of 14 census tracts located adjacent to SR 4 (East) qualify as environmental justice communities based on ethnicity and/or income level. The shaded areas on Figure 2.1.4-3, Environmental Justice Communities, show the location of these census tracts. Census Tract 3120 – which borders most of the SR 4 / Loveridge Road Interchange area on the north side of SR 4 – has high percentages (90 and 20 percent, respectively) of minority and low-income populations. Census Tracts 3131.01 and 3131.02 – which border most of the SR 4 / Loveridge Road Interchange on the south side of SR 4 – each have approximately 60 percent minority populations. Census Tract 3072.01 – south of SR 4, just west of Somersville Road – has a minority population of 55 percent and a low-income population of 16 percent. In Census Tract 3072.02 – north of SR 4, just east Somersville Road – 66 and 20 percent of the population is represented by minority and low-income populations, respectively. Twenty percent of the persons in Census Tract 3050 live below the poverty level.



Source: 2000 U.S. Census Data
Parsons 2003

Legend:

Census Tract Boundary **3072.05 Census Tract Number** **City Boundary** **Railroad**

Note: Shaded areas indicate environmental justice communities.

N

NOT TO SCALE

Figure 2.1.4-3

STATE ROUTE 4 (EAST) WIDENING PROJECT: LOVERIDGE ROAD TO STATE ROUTE 160
04-CC-4-KP 37.9/R46.3 (PM 23.5/R28.8)

ENVIRONMENTAL JUSTICE COMMUNITIES

Equity of Impacts on (and Benefits for) Minority and Low-Income Neighborhoods

The primary purpose of the proposed action is to alleviate traffic congestion along SR 4 between Loveridge Road and SR 160, connecting with the widened SR 4 roadway west of Railroad Avenue. The congestion relief and enhanced accessibility benefits would accrue to area residents and to other users of the SR 4 corridor alike.

There would be some long-term impacts in terms of relocations of 44 residential units and 20 businesses, affecting approximately 132 residents and 150 employees. Some sliver takes of residential and nonresidential properties, primarily affecting existing parking, and noise would also result.

Construction impacts, including noise and fugitive dust from construction activities and short-term roadway closures requiring alternative traffic routing, would have greater effects on residents of the immediate project area than upon other SR 4 users. These effects would fall disproportionately on ethnic minority and low-income individuals only to the extent that these populations are concentrated in the project area. There is no way to construct the corridor improvements without these temporary effects.

Caltrans would mitigate the long-term noise and relocation effects of the project with sound walls consistent with FHWA noise abatement criteria and relocation assistance to residential and business owners in accordance with the Uniform Relocation Assistance Act. Construction phase impacts would be mitigated with Best Management Practices to control noise and fugitive dust. Detour routes would be planned in coordination with local transit operators, the traffic departments of Pittsburg and Antioch, and area emergency service providers, and would be noticed to emergency service providers, transit operators, and SR 4 users in advance. With these mitigation measures in place, there would be no disproportionate adverse effects on minority and low-income residents.

A public involvement program was initiated in October 2001 to provide the public, including minority and low-income populations, a fair opportunity to express their needs and concerns regarding the proposed project, as described in Section 3.1.

2.1.5 Utilities/Emergency Services

2.1.5.1 Affected Environment

Utilities

SR 4 from Loveridge Road to the eastern project limit is a four-lane freeway. There are over 100 utility lines within the project area that include:

- overhead electrical and transmission lines;
- underground electrical, gas, sanitary sewer, water, TV/cable, telephone, and oil lines; and
- water and gas line casings on existing bridge structures.

Pacific Gas & Electric (PG&E) provides gas and electricity service in the study area. SBC maintains the local telephone service and Comcast provides cable service. The oil and non-PG&E gas lines are owned and maintained by various oil companies.

The Contra Costa Water District (CCWD) provides water service to the study area. District facilities include three reservoirs, six water treatment plants, five canal pumping plants, storage tanks, pumps, and lines. *CCWD also maintains and operates facilities including the Contra Costa Canal and several untreated water laterals for the U.S. Bureau of Reclamation.* The CCWD sells untreated water to the cities of Pittsburg and Antioch water districts which provide water treatment and distribution within their respective districts. Wastewater collection and treatment within the study area are provided by the cities of Pittsburg and Antioch and the Delta Diablo Sanitation District.

Emergency Services

Police protection and traffic enforcement in the study area are provided by the Contra Costa County Sheriff's Department, City of Pittsburg Police Department, City of Antioch Police Department, and the California Highway Patrol. A precinct station for the Antioch Police Department is located at 300 L Street within the study area. The Contra Costa Fire Protection District provides fire protection services and emergency medical rescue services; four fire stations are within the study area. Kaiser Permanente Medical Offices are located within the study area in Antioch.

Table 2.1.5-1 summarizes the existing utilities and Table 2.1.5-2 summarizes the emergency services within the corridor.

Table 2.1.5-1: Existing Utilities

Loc No.	Facility			Existing Location			Risk		Relocate		Comments
	Description	Type	Dir	Route/Road	From	To	High	Low	Yes	No	
1	Electrical Line		TR	Route 4	243+65	243+65		X		X	
2	Transmission Line		LE	Route 4	243+60	258+60		X	X		*21 kilovolt (kV), 60 kV*, will include seven new transmission towers
3	Electrical Line		PA	California Ave	100+50	103+50		X	X		Includes six new poles
4	Electrical Line		TR	California Ave	104+10	104+70		X	X		Includes two new poles
5	Gas Line		LE/PA	Route 4	244+05	256+90	X		X		24"; relocate to the north side of California Ave and between North Park Blvd and westbound SR 4
6	Water		TR	Route 4	247+10	247+10		X	X		Relocate 18" ACP to avoid conflict with pumping plant
7	Water		TR	Route 4	248+60	249+20		X		X	10" pipe may have to be extended to the north
8	Sanitary Sewer	UG	TR	Route 4	248+65	250+20		X		X	36" sewer
9	Sanitary Sewer	UG	TR	Route 4	250+20			X		X	8" sewer
10	Sanitary Sewer	UG	TR	Route 4	250+70	252+10		X		X	36" sewer
11	Oil Lines (crude or product)	UG	TR	Route 4	258+40		X			X	18" oil – Equilon
							X			X	4" crude oil (8" casing) - Equilon
							X			X	12" oil (1951 as-builts)
		OH					X			X	12" oil – Chevron
		OH					X			X	8" oil Chevron (idle)
		OH					X			X	6" oil (1951 as-builts)
		OH					X			X	10" (idle) – Chevron
12	Natural Gas Lines	UG	TR	Route 4	258+40		X			X	Tosco (Union Island gas line) 12"
							X			X	Chevron #2, 12"
		UG						X		X	4" unknown pressure (1951 as-builts)
		UG					X			X	10" in 18" casing - Equilon
							X			X	10" – Calpine
13	Water Lines	UG	TR	Route 4	258+40			X		X	15" water – *CCWD/USBR Lateral 14.0*
								X		X	12" water to US Steel
								X		X	2" water – Chevron
								X		X	4" (1951 as-builts)
14	Electric Line	UG	TR	Century/Rte 4	259+00		UNK	UNK		X	One active line in one conduit (voltage unknown), and four spare 6" PVC conduits (PG&E)

Table 2.1.5-1: Existing Utilities

Loc	Facility			Existing Location			Risk		Relocate		Comments
No.	Description	Type	Dir	Route/Road	From	To	High	Low	Yes	No	
15	Sanitary Sewer	UG	TR	Century/Rte 4	259+00			X		X	15" sewer in 16" steel casing
16	Electrical Line	OH	LE	Route 4	260+40	266+50		X	X		Includes 10 new poles
17	Sanitary Sewer	UG	PA	Route 4	268+70	272+20		X	X		Next to Kaiser Permanente Hospital in existing utility easement.
18	Sanitary Sewer	UG	PA	Route 4	268+70	269+80		X	X		Size unknown
19	Water	UG	PA	Route 4	267+00	270+40		X	X		Size unknown
20	Sanitary Sewer	UG	TR	Route 4	268+70			X		X	10”
21	Gas Line	UG	PA	Route 4	273+50	276+00	X		X		24" conduit; relocate north of westbound on-ramp at Somersville)
22	Electrical Line	OH	PA	Route 4	274+90	275+60		X	X		Includes two new poles
23	Transmission Line	OH	LE	Route 4	274+50	276+40		X	X		*21kV, 60kV*; includes two new small towers
24	Electrical Line	OH	PA	Somersville Rd	101+60	106+20		X	X		Includes seven new poles
25a	Water	UG	PA	Somersville Rd	101+30	102+70		X		X	Size unknown
25b	Water	UG	PA	Somersville Rd	102+70	103+60		X	X		Relocate to avoid conflict with column/footing
25c	Water	UG	PA	Somersville Rd	103+60	105+10		X		X	Size unknown
26a	TV/Cable	UG	PA	Somersville Rd	101+30	102+70		X		X	
26b	TV/Cable	UG	PA	Somersville Rd	102+70	103+60		X	X		Relocate to avoid conflict with column/footing
26c	TV/Cable	UG	PA	Somersville Rd	103+60	105+10		X		X	Data line
27	Telephone	UG	PA	Somersville Rd	101+30	105+10		X		X	
28	Electrical Line	OH	PA	Route 4	275+05	279+45		X	X		Includes eight new poles
29	Transmission Line	OH	LE	Route 4	286+95	292+10		X	X		*21kV, 60kV*; includes five new small towers
30	Gas Line	UG	PA	Route 4	287+90	292+20	X		X		24" conduit in 30" casing
31	Electrical Line	OH	PA	Route 4	287+40	290+40		X	X		Includes six new poles (runs along eastbound off-ramp to L St)
32	Water	UG	PA	Contra Loma/L St	100+60	102+35		X		X	
33	Telephone	UG	PA	Contra Loma/L St	100+60	102+35		X		X	Data line
34	Sanitary Sewer	UG	PA	Contra Loma/L St	100+60	102+35		X		X	
35	Electrical Line	UG	PA	Contra Loma/L St	100+60	102+35		X		X	Possibly TV line
36	Gas Line	UG	PA	Contra Loma/L St	100+60	102+35		X		X	4" conduit in 8" casing
37	Electrical Line	OH	PA	Contra Loma/L St	100+20	102+50		X	X		Includes six new poles
38	Transmission Line	OH	LE	Route 4	293+40	296+00		X		X	*21kV, 60kV,* Transmission line

Table 2.1.5-1: Existing Utilities

Loc	Facility			Existing Location			Risk		Relocate		Comments
No.	Description	Type	Dir	Route/Road	From	To	High	Low	Yes	No	
39	Gas Line	UG	TR	Route 4	295+30	295+30	X			X	24" conduit in 30" casing
40	Gas Line	STR	PA	"G" Street	101+70	103+00	X		X		6" conduit (casing on bridge structure)
41	Water	STR	PA	"G" Street	101+70	103+00		X	X		Casing on bridge structure
42	Telephone	UG	TR	Route 4	300+45	300+55		X		X	Data line
43	Electrical Line	OH	TR	Route 4	300+45	300+55		X		X	Local line
44	Gas Line	UG	TR	Route 4	300+45	300+55		X		X	4" conduit in 8" casing
45	Gas Line	UG	TR	Route 4	300+45	300+55	X			X	6" conduit in 10" casing
46	Water	UG	TR	Route 4	302+25			X		X	
47	Water	UG	PA	Route 4	302+25	303+70		X	X		On Drake St from transverse water line
48	Water	UG	PA	Route 4	302+50	303+70		X	X		On Drake St
49	Sanitary Sewer	UG	PA	Route 4	302+70	303+70		X	X		On Drake St
50	Gas Line	UG	PA	Route 4	302+50	303+50		X	X		4”, between westbound on-ramp at A St & Drake St
51	TV/Cable	UG	PA	Route 4	302+70	303+30		X	X		North side of Drake St
52	Electrical Line	OH	PA	Route 4	302+70	303+30		X	X		North side of Drake St (includes two new poles)
53	Gas Line	UG	TR	Route 4	303+70	305+45	X			X	24" conduit, STANPAC No. 5
54	Gas Line	UG	TR	Route 4	303+70	304+70	X			X	34" conduit, line 191
55	Gas Line	UG	TR	Route 4	303+70	304+30	X			X	8" conduit
56	Electrical Line	OH	TR	Route 4	303+70	304+60		X	X		Includes three new poles
57	Electrical Line	UG	PA	A Street	22+20	24+40	UNK	UNK		X	Voltage unknown (along A Street)
58	Telephone	UG	PA	A Street	22+20	24+40		X		X	Data line (along A Street)
59	Electrical Line	OH	PA	Route 4	303+80	306+50		X	X		Includes nine new poles (Bryan Ave to Sunset Dr)
60	Gas Line	UG	PA	Route 4	304+85	305+20		X	X		2" conduit (from Sunset Dr to Bryan Ave)
61	Gas Line	UG	PA	Route 4	305+30	306+35		X	X		4" conduit in 6" casing, on Bryan Ave to A St
62	Sanitary Sewer	UG	PA	Route 4	305+00	305+30		X	X		On Bryan Ave cul-de-sac
63	Water	UG	PA	Route 4	305+00	305+30		X	X		On Bryan Ave cul-de-sac
64	Sanitary Sewer	UG	PA	Route 4	306+10	306+45		X	X		On Sunset Dr cul-de-sac
65	Water	UG	PA	Route 4	305+30	306+40		X	X		From Bryan Ave to Sunset Dr cul-de-sac
66	Sanitary Sewer	UG	PA	A Street	22+20	22+30		X	X		Includes one new manhole
67	Gas Line	UG	TR	Route 4	311+90	312+70	X			X	24" conduit in 30" casing

Table 2.1.5-1: Existing Utilities

Loc	Facility			Existing Location			Risk		Relocate		Comments
No.	Description	Type	Dir	Route/Road	From	To	High	Low	Yes	No	
68	Transmission Line	OH	TR	Route 4	311+90	312+70		X		X	*21kV, 60kV*
69	Gas Line	UG	TR	Route 4	311+90	312+70	X			X	34" conduit in 42" casing
70	Sanitary Sewer	UG	TR	Route 4	316+50			X		X	20"
71	Electrical Line	OH	TR	Route 4	317+50			X		X	Local line
72	Transmission Line	OH	TR	Route 4	317+95			X		X	*21kV, 60kV* (independent line)
73	Transmission Line	OH	TR	Route 4	318+10			X		X	*21kV, 60kV* (independent line)
74	Water	UG	TR	Route 4	312+10			X		X	
75a	Electrical Line	STR	PA	Hillcrest Ave	100+00	100+55	X			X	On proposed southbound bridge structure - four lines:
75b	Electrical Line	STR	PA	Hillcrest Ave	100+55	102+35	X		X		Two 3-1000A XPL/CONC. PVC 6" 21kV
75c	Electrical Line	STR	PA	Hillcrest Ave	102+35	103+10	X			X	Two 3-1100A EPR 21 KV 6"
76	TV/Cable	UG	PA	Hillcrest Ave	100+00	103+10		X		X	On existing northbound bridge structure (two 2" conduits)
77	Gas Line	STR	PA	Hillcrest Ave	100+55	102+35	X		X		6” on proposed southbound bridge structure
78	Transmission Line	OH	TR	Route 4	324+55			X		X	Voltage unknown (independent line)
79	Transmission Line	OH	TR	Route 4	325+55			X		X	Voltage unknown (independent line)
80	Water	UG	TR	Route 4	327+70	327+80		X		X	*CCWD/USBR Lateral 9.1*
81	Water	UG	TR	Route 4	327+70	327+80		X		X	
82	Transmission Line	OH	TR	Route 4	303+70	305+10		X		X	*21kV, 60kV*
83	Transmission Line	OH	TR	Route 4	258+60			X		X	Voltage unknown
84	Water	UG	TR	Route 4	258+30			X		X	14” water (Pittsburg)
85	Water	UG	LE/PA	Route 4	259+90	261+00plus		X	TBD		14” water (Pittsburg)

LEGEND:
TR Transverse Direction – Crosses SR 4
PA Parallel Direction – Parallel to but outside of the right-of-way
LE Longitudinal Encroachment – Parallel to but encroaching on the right-of-way
OH Overhead Utility
UG Underground Utility
STR Utility on Bridge Structure
UNK Unknown

Source: Parsons 2003

Table 2.1.5-2: Existing Emergency Services in the Study Area

No.	Name	Address	No.	Name	Address
	Hospitals			**Fire Stations**	
H1	Kaiser Permanente Medical Offices	3400 Delta Fair Boulevard, Antioch	FD1	Antioch Fire Department	2717 Gentrytown Drive, Antioch
			FD2	Antioch Fire Department	315 West 10th Street, Antioch
	Police Stations		FD3	Antioch Fire Department	2900 Lone Tree Way, Antioch
PD1	Antioch Police Department	300 "L" St., Antioch	FD4	Pittsburg Fire Station 85	2555 Harbor Street, Pittsburg
Source: Parsons 2003					

2.1.5.2 Impacts

Impacts associated with the various utility relocations are addressed in this environmental document pursuant to California Public Utilities Code GO-131D filing requirements. Most of the existing utilities do not present conflicts to the proposed Build Alternative; they have the potential to be affected during construction, however. Table 2.1.5-1 shows that 39 utility lines would likely require relocation to avoid conflicts with the proposed improvements, such as bridge columns and footings, pumping plants, and new pavement. Potential relocation *easements* for utilities relocated outside of the proposed freeway right-of-way are shown in Figure A. *Precise field* locations may *vary for utilities such as the 21kV and 60kV electrical lines,* and relocation details would be worked out with the utility providers during the final design phase of the project *in accordance with Caltrans procedures.* Several utilities encroach on the right-of-way longitudinally or cross SR 4 at a skewed angle. Potential impacts to the emergency services would be short-term, occurring only during construction, and are discussed along with construction phase impacts to utilities, in Section 2.4.3, *Utilities/Emergency Services*.

2.1.5.3 Avoidance, Minimization, and Compensation Measures

Many of the utilities that would require relocation would be relocated in advance of project construction. Design, construction, and inspection of utilities relocated for the project would be done in accordance with Caltrans statutes. Caltrans and CCTA would coordinate with the affected service provider in each instance to ensure that work is in accordance with the appropriate requirements and criteria.

In addition, coordination with the utility providers would be initiated during the preliminary engineering phase of the project and would continue through final design and construction. Coordination efforts would plan utility re-routes, identify potential conflicts, ensure that construction of the proposed project minimizes disruption to utility operations, and formulate strategies for overcoming problems that may arise.

Measures to avoid or minimize disruptions to the emergency services and utilities during construction of the project are discussed in Section 2.4.3, Utilities/Emergency Services.

2.1.6 Traffic and Transportation/Pedestrian and Bicycle Facilities

2.1.6.1 Affected Environment

Highway Network

SR 4 extends in an east-west direction through the northern portion of Contra Costa County, connecting I-80 at the City of Hercules on the west with SR 160 and the City of Oakley on the east. Through the study corridor, SR 4 has two mixed-flow lanes in each direction that are generally 3.65 meters (nearly 12 feet) in width. The outside shoulders range from 1.2 to 3.0 meters (4 to 10 feet) in width. Major arterial streets serving the project area are Hillcrest Avenue, California Avenue, and Loveridge Road.

According to Caltrans' website (http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/2002all.html), 2002 annual average daily traffic (AADT) volumes along SR 4 range from 37,500 to 101,000 vehicles (both directions), as shown in Figure 2.1.6-1. Directly west of the Bailey Road interchange, daily traffic volumes are reported to exceed 112,000 vehicles.

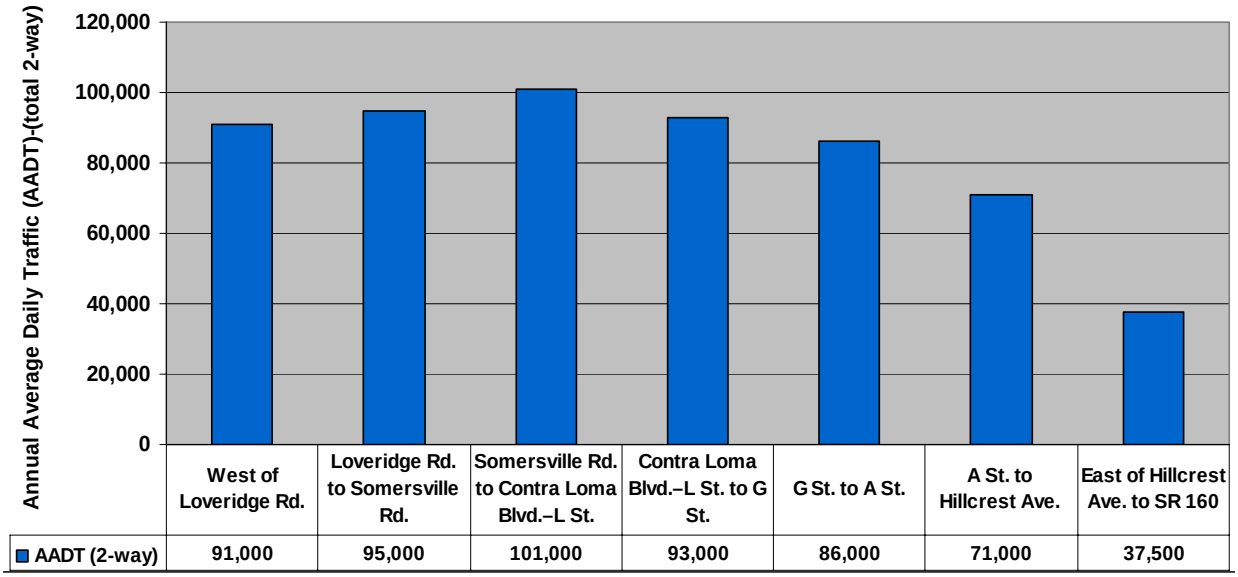


Figure 2.1.6-1: Caltrans 2002 Annual Average Daily Traffic Volumes on SR 4

During the period of data collection for the present project, SR 4 was being widened to eight lanes between the Railroad Avenue and Bailey Road interchanges. In the westbound direction, following the construction zone west of Railroad Avenue, SR 4 was widened from two to three lanes and then to four lanes before the Bailey Road interchange. In the eastbound direction, SR 4 merged from four to three lanes and then to two lanes east of the Bailey Road interchange, and traversed through the construction zone west of Railroad Avenue before entering the traffic study area.

The traffic study area is illustrated in Figure 2.1.6-2. Major area streets are described in the following paragraphs.

Loveridge Road extends in a northeast-southwest direction across SR 4 through the City of Pittsburg and connects Buchanan Road on the south with the Pittsburg-Antioch Highway on the north. Loveridge Road provides two travel lanes in each direction between Buchanan Road and the Pittsburg-Antioch Highway. It carries an average daily traffic (ADT) volume of approximately 19,000 vehicles at the Loveridge Road interchange.

California Avenue extends in an east-west direction on the north side of SR 4, connecting Railroad Avenue to the west with Loveridge Road to the east. It provides one travel lane in each direction and has an ADT volume of approximately 12,000 vehicles.

East Leland Road/Delta Fair Boulevard. East Leland Road extends in an east-west direction south of SR 4 through the City of Pittsburg, changing to Delta Fair Boulevard in the City of Antioch. It connects Bailey Road on the west with Somersville Road and Buchanan Road on the east. East Leland Road provides two travel lanes in each direction and has an ADT volume of approximately 25,000 vehicles east of Railroad Avenue. It serves as an alternate parallel route to SR 4 when SR 4 is congested.

Pittsburg-Antioch Highway/10th Street. Pittsburg-Antioch Highway extends in an east-west direction on the north side of SR 4 through the City of Pittsburg and connects Solari Street and Willow Pass Road west of the study area with the City of Antioch, changing to West 10th Street at Somersville Road and connecting to A Street on the east. Most sections provide two travel lanes in each direction, although some sections have only one lane in each direction. Pittsburg-Antioch Highway/10th Street carries an ADT volume of about 20,000 vehicles east of Loveridge Road and approximately 10,000 west of Loveridge Road. It serves as an alternate parallel route to SR 4 when SR 4 is congested.

Somersville Road extends in a northeast-southwest direction across SR 4 through the City of Antioch, connecting the Black Diamond Mines Preserve south of the study area to Pittsburg-Antioch Highway/ 10th Street on the north. Somersville Road provides two travel lanes in each direction and has an ADT volume of 20,000 vehicles between Sycamore Drive and West 18th Street.

Contra Loma Boulevard–L Street extends in a north-south direction across SR 4 in the City of Antioch, connects James Donlon Boulevard south of the study area to West 10th Street on the north, and extends farther north to Antioch's downtown area. South of SR 4, the street is called Contra Loma Boulevard, while north of SR 4, it is named L Street. Within the study area, Contra Loma Boulevard–L Street has two travel lanes in each direction and serves about 15,000 vehicles per day.

G Street runs north-south across SR 4 in the City of Antioch, connects James Donlon Boulevard south of the study area to West 10th Street on the north, and extends farther north to the downtown area. G Street provides one travel lane in each direction and serves approximately 12,000 vehicles per day.

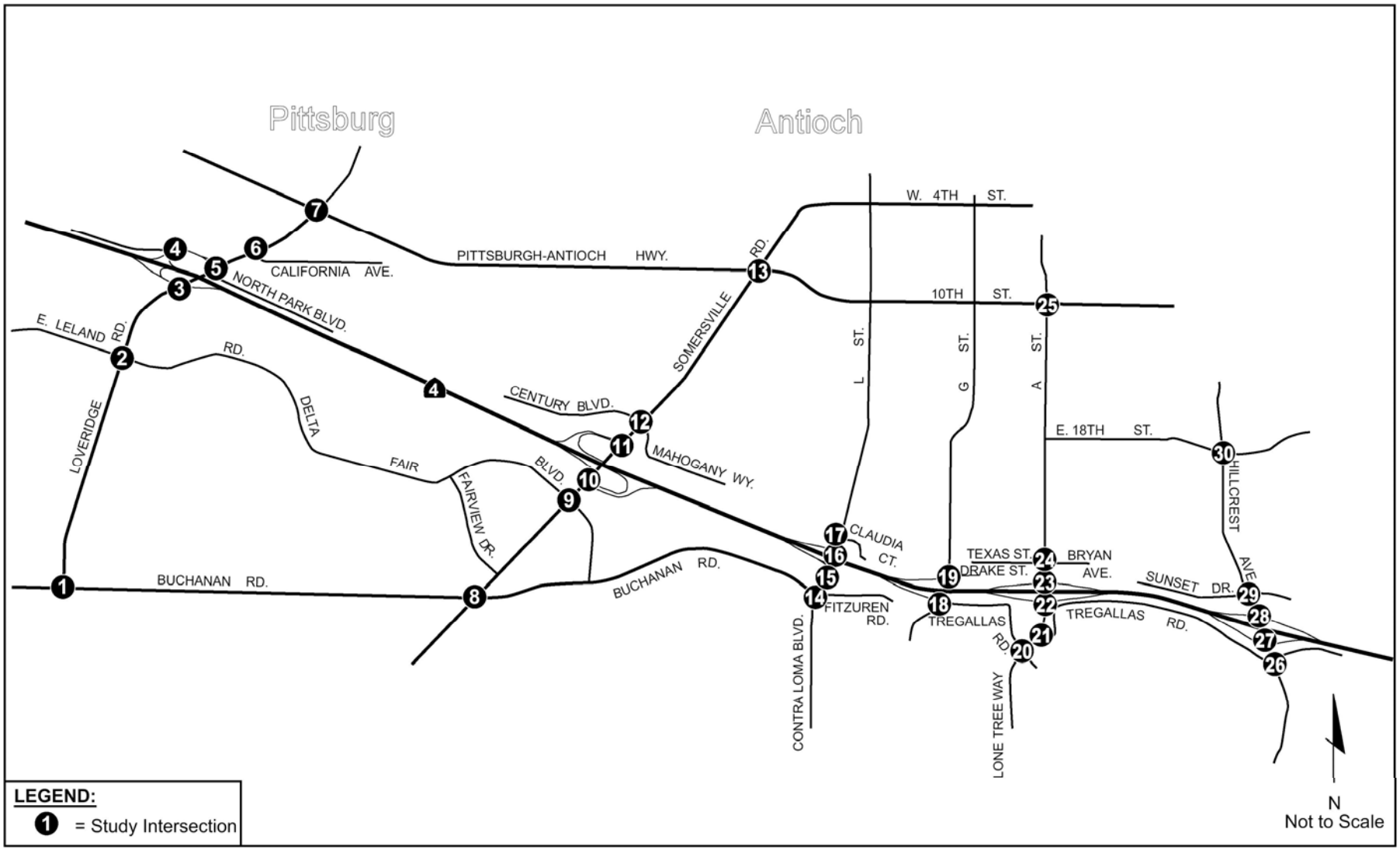


Figure 2.1.6-2

STATE ROUTE 4 (EAST) WIDENING PROJECT: LOVERIDGE ROAD TO STATE ROUTE 160
04-CC-4-KP 37.9/R46.3 (PM 23.5/R28.8)

TRAFFIC STUDY AREA MAP

Lone Tree Way–A Street runs north-south across SR 4 and is named as Lone Tree Way south of SR 4 and A Street north of it. It connects the City of Brentwood to the southeast to West 10th Street to the north and provides two travel lanes in each direction within the study area. It carries about 25,000 vehicles per day just south of SR 4.

Hillcrest Avenue runs north-south across SR 4 and connects to Lone Tree Way to the southeast and 18th Street to the north. Within the study area, it provides two travel lanes in each direction and carries about 35,000 vehicles per day just south of SR 4.

Current Peak-Hour Conditions on SR 4

Current peak-hour conditions on SR 4 were rated according to several measures of effectiveness, which are summarized in Table 2.1.6-1 and discussed in the following paragraphs. The measures include travel demand served, vehicle kilometers of travel (vehicle miles of travel), average travel time, average travel speed, vehicle delay, duration of congestion, and level of service. Level of service is presented separately to illustrate variations by roadway segment. Last, safety is discussed in the context of recent accident data.

Table 2.1.6-1: Existing Peak Hour Measures of Effectiveness[1]

Measure of Effectiveness	Eastbound A.M. Peak	Eastbound P.M. Peak	Westbound A.M. Peak	Westbound P.M. Peak
Travel Demand Served (vehicles/hour)	4,549	6,031	5,499	4,810
Vehicles Kilometers of Travel (veh-km) [Vehicle Miles of Travel (veh-mi)]	20,023 [12,442]	27,373 [17,009]	10,216 [6,348]	20,395 [12,673]
Average Travel Time (min)	4.7	6.7	22.2	4.7
Average Travel Speed (kph) [mph]	105 [65]	80 [50]	39 [24]	103 [64]
Vehicle Delay (vehicle-hours)	0	157	252	0
Est. Duration of Congestion (hours) [2]	0	3	3-4	0

Notes:
1. The study section of SR 4 extends from west of Loveridge Road to east of Hillcrest Avenue.
2. Duration of congestion is estimated based on field observations. This is the only measure of effectiveness that is not based directly on the peak-hour conditions. The amount of overflow demand from the peak hour determines the duration of congestion.

Source: Fehr & Peers Associates, June 2004.

Measures of Effectiveness:

Travel demand served is based on the mainline volumes and off-ramp volumes (i.e., Loveridge Road, Somersville Road, L Street, A Street, and Hillcrest Avenue) that can be served during the peak hour, given current SR 4 capacity and operations. During the morning peak hour, about 5,500 vehicles can be served in the westbound direction. During the evening peak hour, over 6,000 vehicles can be served in the eastbound direction. Peak-hour demand exceeding capacity causes congestion, generating queues of

'stop-and-go' vehicles and lowering freeway throughput. Overflow demand, which includes all vehicles that would travel in the peak hour but cannot fit given capacity constraints, "spreads" into the adjacent hours. Overflow demand for SR 4 creates a congested westbound morning peak period of three to four hours duration and a congested eastbound evening peak period of three hours duration.

Vehicle kilometers of travel (VKT) [vehicle miles of travel (VMT)] represent the total distance traveled by all vehicles using SR 4 during the peak hour. VKT (VMT) is the sum of the peak hour vehicle volume served for each SR 4 segment multiplied by the distance of that segment. In severe congestion (morning westbound direction), SR 4 through the project area can produce only about 10,200 VKT (6,300 VMT). In the evening eastbound direction, VKT exceeded 27,300 (17,000 VMT) due to relatively less congestion compared to the morning westbound direction.

Average travel time through the study corridor for existing conditions was determined in the field. Travel time surveys were conducted to determine the total time required for a Single Occupant Vehicle (SOV) to travel on the freeway mainline between the Loveridge Road and Hillcrest Avenue interchanges. Consistent with the VKT measure, travel time is longest in the morning westbound direction with an average time of 22 minutes, while average travel time in the evening eastbound direction is only 7 minutes.

Average travel speed was calculated based on the travel time survey results. Travel times were determined for each segment of the study corridor. Average travel speed was then calculated by taking a weighted average of the length of each segment divided by the travel time for each segment. The peak direction average travel speed is 39 kph (24 mph) during the morning, indicating very congested conditions, and 80 kph (50 mph) during the evening, which is congested with stop-and-go traffic. In the off-peak directions morning and evening, average travel speed is about 64 mph, which reflects essentially free-flow conditions.

Vehicle delay is the amount of delay incurred during the peak hour as a result of congestion on a freeway or ramp and is represented in units of vehicle-hours. As shown in Table 2.1.6-1, only the peak directions experience delay; the morning westbound delay is 60 percent greater than the evening eastbound delay.

The duration of congestion is defined as the amount of time that vehicles are in queue and traveling at substantially slower speeds than the free-flow speed. Based on field observations on SR 4, congestion currently lasts between three and four hours in the morning westbound direction and about three hours in the evening eastbound direction.

The Level of Service

Level of service (LOS) is a qualitative description of traffic flow based on speed, travel time, delay, and freedom to maneuver using the relationships presented in Table 2.1.6-2. There are six levels, ranging from LOS A (representing the best operating conditions) to LOS F (worst conditions). LOS E represents very congested conditions and "at-capacity" operation. When volumes exceed capacity, stop-and-go conditions result, and operations are designated as LOS F.

Table 2.1.6-2: Freeway Mainline Level of Service Criteria[1]

Level of Service	Maximum Density passenger cars/kilometer (mile) /lane	Minimum Speed kph (mph)
A	7 (11)	104.6 (65)
B	11 (18)	104.6 (65)
C	16 (26)	104 (64.6)
D	22 (35)	96.1 (59.7)
E	28 (45)	84 (52.2)
F	> 28 (> 45)	< 84 (< 52.2)

Note:
1. Freeway mainline LOS based on a 104.6 kph [65 mph] free-flow speed.

Source: Highway Capacity Manual (HCM) – Chapter 23, "Basic Freeway Sections", Transportation Research Board, 2000.

Currently, the morning westbound direction along SR 4 to the west of the A Street interchange operates at LOS F. Also west of the A Street interchange, the evening eastbound direction operates at LOS E or F. The remainder of the corridor operates at LOS D or better. That is, traffic conditions are better east of the A Street interchange. See Appendix E for more details.

Safety

Project traffic studies reviewed the three-year accident history, from October 1, 1999 through September 30, 2002, for the SR 4 corridor from just west of the Loveridge Road Interchange eastward to SR 160 for both the mainline and the interchange ramps. These data were compared to state-wide accident averages for similar facilities. The accident rates for the mainline segments and nine of the 23 ramps were found to be higher than the state-wide average. A previous study that reviewed the 1996-1998 accident data (presented in the Project Study Report for this project) showed that accident rates in this stretch of SR 4 six to eight years ago were less than the state average.

Table 2.1.6-3 identifies the locations where the 1999 to 2002 accident rates were higher than state-wide averages (See Appendix E for a complete list). The most prevalent type of accident appeared to be rear-end collisions, which is consistent with the highly-congested conditions observed during this time. Most of the collisions occurred between the off- and on-ramps of an interchange.

In reviewing individual accident records, the majority of accidents occurring along SR 4 were those typically associated with excessive speed and congested conditions: rear-end collisions, collisions with objects off road and side-swipe collisions. Fifty-four percent of all accidents on the mainline occurred in the westbound direction and 46 percent in the eastbound direction. Percentages of mainline accidents tabulated by collision type are shown in Table 2.1.6-4. The following paragraphs discuss the three-year SR 4 mainline accident history in detail.

There was a high accident concentration, 106 accidents, in the vicinity of the Loveridge Road Interchange between the on- and off-ramps, with approximately 60 percent of accidents occurring in the eastbound direction. Approximately 80 percent of the accidents were congestion related, and approximately 38 percent occurred during the afternoon peak four hours. At this location, the existing vertical sag curve

and outside and inside shoulders do not meet current design standards. The existing Loveridge Road overcrossing structure has closed-end abutments, which restrict lateral sight distance and give a closed-in feeling. These existing conditions are among the roadway deficiencies discussed in the project Purpose and Need statement in Section 1.2.3.9, Improve Safety.

Table 2.1.6-3: SR 4 Accident History October 1, 1999 through September 30, 2002
(locations where accident rates exceed statewide averages)

Route 4/Location	Number of Accidents			Accident Rates (ACCS/MVKM)					
				Actual SR 4 Rate			Statewide Average		
	Tot.	Fat.	Inj.	Fat.	F+I	Tot.	Fat.	F+I	Tot.
SR 4 Mainline									
-KP 37.6 to 47.6 -(PM 23.4 to R029.6) Eastbound (EB)	357	2	131	0.004	0.29	0.78	0.009	0.28	0.76
-KP 37.6 to 47.6 -(PM 23.4 to R029.6) Westbound (WB)	425	2	151	0.004	0.34	0.93	0.009	0.28	0.76
Loveridge Road									
-EB off to Loveridge	9	0	5	0.000	0.40	0.73	0.003	0.38	0.93
-EB on from NB Loveridge	6	0	2	0.000	0.29	0.88	0.002	0.14	0.37
-WB off to Loveridge	3	0	2	0.000	0.27	0.41	0.005	0.39	1.15
-WB on from Loveridge	3	0	2	0.000	0.18	0.27	0.001	0.12	0.34
Somersville Road									
-EB off to SB Somersville	5	0	1	0.000	0.14	0.71	0.002	0.14	0.37
-EB off to NB Somerville	8	0	3	0.000	0.32	0.86	0.002	0.26	0.78
-WB on from Somersville	9	1	2	0.065	0.19	0.58	0.001	0.20	0.50
Contra Loma Boulevard – L Street									
-WB on from L Street	4	0	3	0.000	0.46	0.62	0.001	0.20	0.50
Lone Tree Way – A Street									
-EB on from A Street	3	0	2	0.000	0.35	0.52	0.001	0.20	0.50

Source: Caltrans, TASAS, 2003.

Table 2.1.6-4: Percentages of SR 4 Mainline Accidents by Collision Type

Collision Type	Westbound (%)	Eastbound (%)
Head-On	0	0
Sideswipe	19	10
Rear-End	56	56
Broadside	3	1
Hit Object	20	26
Overturn	1	4
Auto-Pedestrian	0	1
Other	1	2

Source: Caltrans, TASAS, 2003

Another location having a high accident concentration, 53 accidents, is the eastbound approach to the Somersville Road undercrossing. Approximately 49 percent of the accidents during the 1999 to 2002 period occurred in the afternoon peak four hours, and 57 percent of the accidents were attributed to speeding. Approximately 64 percent of the accidents were congestion related and approximately 28 percent involved objects struck beyond the outside shoulder. The existing outside shoulder width at this location is about 2.5 meters (8.2 feet), which is less than the current Caltrans standard of 3.0 meters (10 feet) wide shoulders for four lane highways.

In the westbound direction, there is a high accident concentration between the on- and off-ramps at the Somersville Road Interchange. A total of 76 accidents occurred on this section, and approximately 46 percent of them occurred in the peak morning four hours. Speeding contributed to about 64 percent of the accidents, and 84 percent were congestion related.

There were two fatal accidents in the westbound direction. One involved a rear-end collision that resulted in a vehicle going over an embankment and the other an overturned vehicle with driving under the influence as the primary collision factor. One of the westbound fatal accidents occurred approximately 0.4 kilometers (0.2 mile) east of Loveridge Road and the other occurred approximately 0.4 kilometers (0.2 mile) east of Somersville Road. One eastbound fatal accident occurred just west of the G Street overcrossing; its primary collision factor is unknown. The vehicle ran off the road, ran into the cut slope and bottom of structure and overturned. The other eastbound fatal accident involved driving under the influence in which an eastbound vehicle crossed over the median and struck a westbound vehicle. There have been nine other accidents in this location just west of G Street and six involved hit objects. This segment of freeway is along a 914-meter (3,000-foot) radius curve with 2.4-meter (8-foot) outside shoulders, which is less than the current 3.0 meter (10-foot) standard for four-lane highways. The existing G Street overcrossing structure has closed-end abutments.

Future Peak-Hour Conditions on SR 4 under the No-Build Alternative

Future peak-hour conditions on SR 4 under the No-Build Alternative were rated according to the corridor measures of effectiveness presented previously, which are summarized in Table 2.1.6-5 and discussed in the following paragraphs. Two additional measures of effectiveness are discussed for 2030 conditions only: local traffic diversion and length of critical queue. Level of service on the freeway segments in the study area is also used to rate future conditions on SR 4.

Measures of Effectiveness

Demand Served: Between 2000 and 2030, 50 percent population and 125 percent employment growth in the SR 4 corridor is projected to increase corridor travel demand by about 60 percent, with or without the SR 4 East Widening Project. Demand served during the peak hour would also increase but would be limited by SR 4 capacity. By 2030, demand served during the peak hour would increase by 33 to 56 percent, depending on the peak period and direction served. The higher percentages of 50 percent and over would occur only in the off-peak direction, where there is currently unutilized capacity. The No-Build Alternative would be able to serve only 85 percent of the peak-direction peak-hour demand and 90 to 95 percent of the off-peak direction peak-hour demand. As noted previously, excess demand causes very congested conditions, which decrease the effective capacity of the highway, greatly reduce speeds, and increase travel times. The peak period would spread over many hours to serve the total demand.

VKT: Vehicle kilometers of travel (VKT) would also be higher in 2030, reflecting the 60 percent increase in corridor travel demand that will result from corridor growth, with or without the project. The most dramatic peak-hour increase would be in the westbound morning peak direction. This increase would result from eliminating the current construction zone bottleneck and queues west of the project area from widening SR 4 to six mixed-flow lanes and two HOV lanes through the Railroad Avenue interchange, stopping west of Loveridge Road. Even with this increase in peak-hour VKT, the peak period would continue for most of the day.

Table 2.1.6-5: Existing and 2030 Peak-Hour Measures of Effectiveness on SR 4

Peak-Hour Measure of Effectiveness	Eastbound A.M. Peak Hour			Westbound A.M. Peak Hour			Eastbound P.M. Peak Hour			Westbound P.M. Peak Hour		
	2001 Existing	2030 No Build	2030 Build	2001 Existing	2030 No Build	2030 Build	2001 Existing	2030 No Build	2030 Build	2001 Existing	2030 No Build	2030 Build
Demand Served (vehicles/hr) [1]	4,549	6,820	7,361	5,499	7,765	11,711	6,031	8,044	11,617	4,810	7,491	9,009
Vehicle Kilometers of Travel [veh-km] (Vehicles Miles of Travel [veh-mi]) [2]	20,023 (12,442)	39,451 (24,514)	40,498 (25,164)	10,216 (6,348)	37,390 (23,233)	71,745 (44,580)	27,373 (17,009)	40,472 (25,148)	73,565 (45,711)	20,395 (12,673)	35,333 (21,955)	47,128 (29,284)
Average Travel Time (min.) [3]	4.7	8.7	5.7	22.2	13.4	6	6.7	11.9	6.5	4.7	9.9	5.5
Average Travel Speed [kph (mph)] [3]	105 (65)	85.8 (53.3)	105 (65)	39 (24)	48.1 (29.9)	95.9 (59.6)	80 (50)	66.8 (41.5)	93.8 (58.3)	103 (64)	71 (44)	104.3 (64.8)
Vehicle Delay (veh-hours) [2]	0	187	0	252	455	66	157	384	93	0	256	1
Est. Duration of Congestion (hrs) [4]	0	<1	0	3-4	13	<1	3	7	<1	0	13	<1
Local Traffic Diversion (veh/hr) [5]	N/A	2,293	2,091	N/A	16,582	12,202	N/A	12,612	9,283	N/A	4,734	3,358
Length of Critical Mainline Queue [km (mi.)] [2]	N/A	2.4 (1.5)	0	N/A	17.2 (10.7)	0	N/A	12.4 (7.7)	0.5 (0.3)	N/A	8.2 (5.1)	0

Notes:

1. Demand served computed by summing the off-ramp volumes and the exiting mainline volume from the FREQ model output. Note that increased peak-hour demand served and increased VKT/VMT under the Build Alternative in 2030 is the result of the shorter peak period and does not necessarily cause or indicate increased total daily demand or VKT/VMT.
2. Taken directly from FREQ model output. See Note 1 regarding peak-hour changes compared with daily changes.
3. Based on observations for 2001 conditions, taken directly from FREQ model output for 2030 conditions.
4. Based on observations for 2001 conditions, computed for the SR 4 segment at Loveridge Road according to the methodology identified in *Technical Procedure* (CCTA, September 1997) for 2030 conditions.
5. Based on the CCTA No Project and project alternatives Travel Demand Models. Traffic diversion calculated by summing the directional volumes on parallel arterials (i.e., Buchanan Road and Pittsburg-Antioch Highway) at multiple locations throughout the study corridor.

Source: Fehr & Peers Associates, June 2004.

Average Travel Time: Figure 2.1.6-3 shows the average travel times on SR 4 during peak periods for existing conditions compared to 2030 conditions without the project: eastbound morning (EB AM), westbound morning (WB AM), eastbound evening (EB PM) and westbound evening (WB PM). By 2030, average travel times would increase dramatically, by 78 to over 100 percent in both peaks and directions except for the westbound morning peak direction where it would decrease by 40 percent. This phenomenon is discussed under average travel speed.

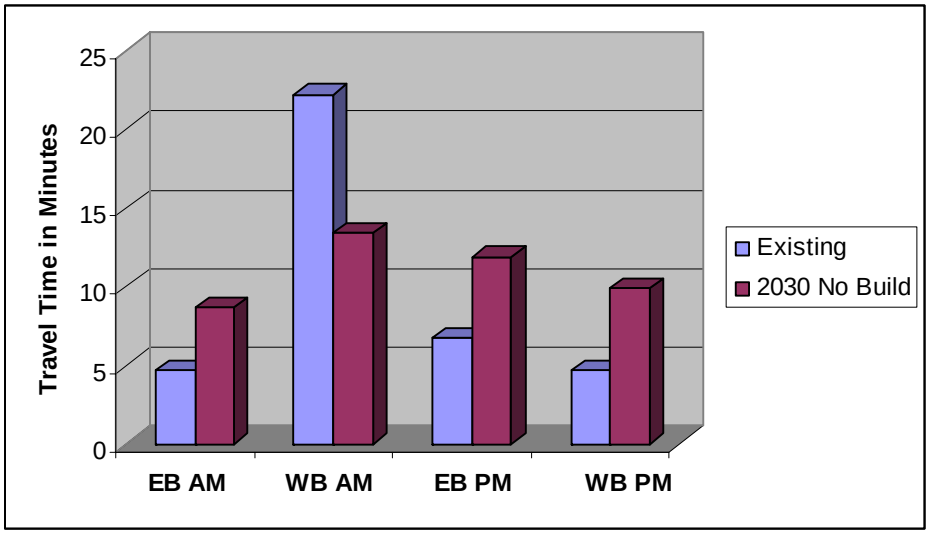
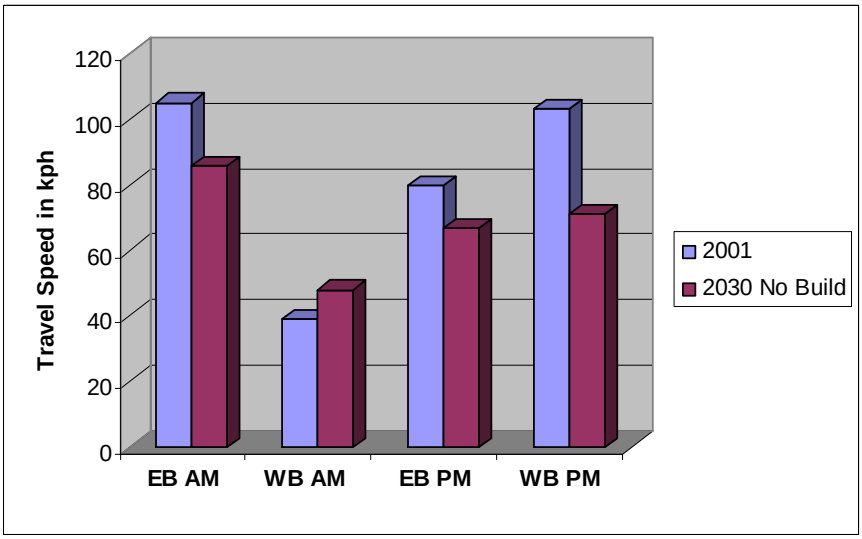


Figure 2.1.6-3: Travel Time along SR 4 during Peak Periods and Directions – Existing and Future Conditions without the Project

Average Travel Speed: Reflecting the findings for average travel times, average travel speeds would slow under 2030 No-Build conditions for all time periods except the westbound morning peak condition, as shown in Figure 2.1.6-4. Table 2.1.6-5 indicates that average travel speed in the westbound morning peak direction would increase from 39 kph (24 mph) to about 48 kph (30 mph). This projected increase in 2030 No-Build westbound morning peak speed would be the result of removing the current construction zone west of the project area. Construction activity that was ongoing and created a bottleneck at the time of this study—reducing level of service and travel speeds—would not exist in the future and therefore future No-Build speed would increase relative to current conditions. In general, however, average travel speeds in the SR 4 corridor under 2030 No-Build conditions would correspond to LOS F for most peak period travel. The morning eastbound direction is projected to have a 2030 average travel speed corresponding to LOS E.



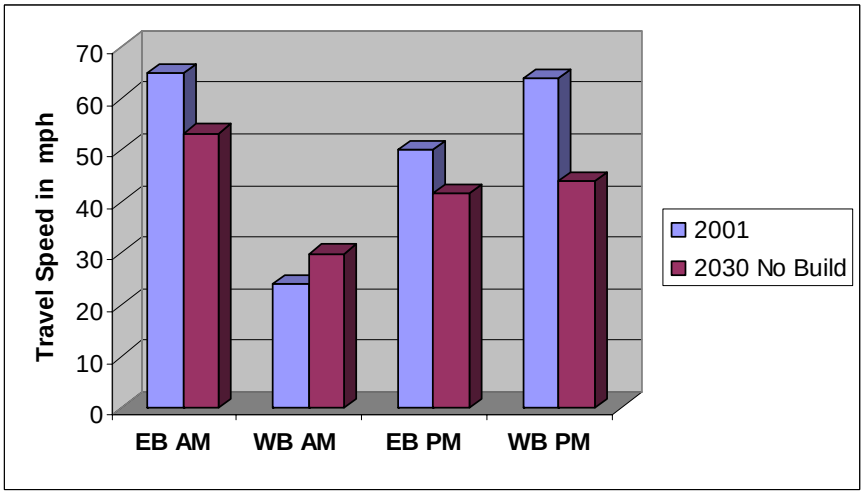


Figure 2.1.6-4: Travel Speed along SR 4 Study Area during Peak Periods and Directions – Existing and Future Conditions without the Project

Vehicle Delay: Compared to existing conditions, 2030 vehicle delay in the peak directions under the No-Build Alternative would increase by about 80 percent westbound and by 145 percent eastbound. Ending the current construction delay is the primary factor slowing the increase in westbound delay compared with eastbound delay. Under the No-Build Alternative, delay in 2030 off-peak directions would increase even more dramatically—from zero hours currently to 187 hours eastbound in the morning and 256 hours westbound in the evening.

Duration of Congestion: Congestion would also increase dramatically without the SR 4 East Widening project. Under the No-Build Alternative, congestion in the westbound direction is expected to grow from its current level of three to four hours to 13 hours by 2030, essentially all day through both the morning and evening peak periods. Congestion in the eastbound direction is expected to

grow from the current level of three hours during the evening peak period to seven hours by 2030 (Figure 2.1.6-5).

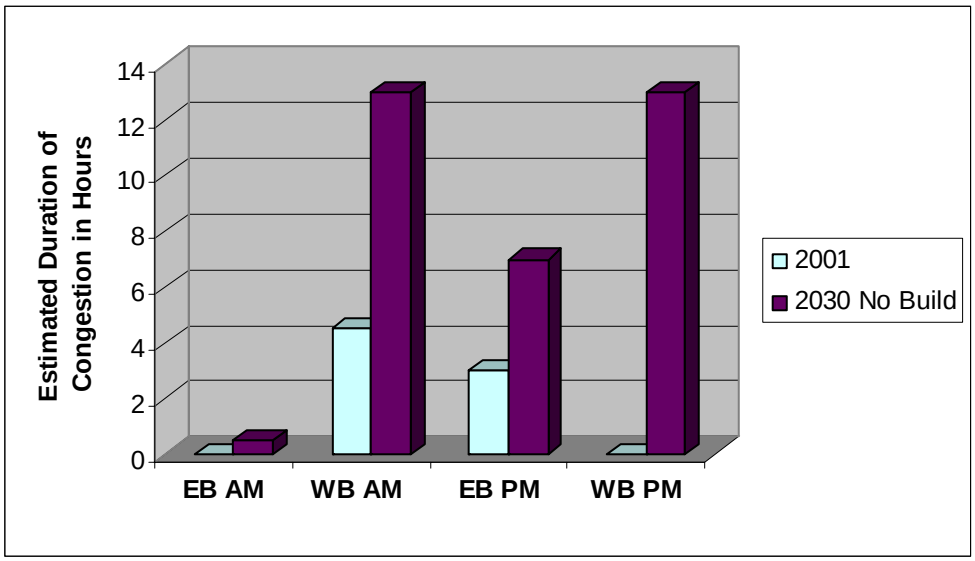


Figure 2.1.6-5: Estimated Duration of Congestion in the Study Area during Peak Periods and Directions– Existing and Future Conditions without the Project

Local Traffic Diversion: Congested conditions on SR 4 currently cause local streets along SR 4 to be used as alternate routes for freeway traffic. Without SR 4 widening, local traffic use of the parallel arterials of Buchanan Road and Pittsburg-Antioch Highway would reach almost 17,000 vehicles per hour westbound in the morning peak direction and nearly 13,000 vehicles per hour eastbound in the evening peak direction in 2030.

Length of Critical Queue: The length of the critical or most important queues on SR 4 under the No-Build Alternative in 2030 would extend throughout the project area, reaching over 17 kilometers (10 miles) in the morning westbound peak and 12.4 kilometers (7.7 miles) in the evening eastbound peak. Queues in the off-peak directions are estimated to be 2.4 kilometers (1.5 miles) in the morning eastbound direction and 8.2 kilometers (5.1 miles) in the evening westbound direction.

Level of Service:

SR 4 experiences peak traffic during the morning peak period in the westbound direction and evening peak period in the eastbound direction. Many of the SR 4 mainline segments in the study area, are currently operating at stop-and-go conditions, LOS F, during these peak periods. For the westbound and eastbound SR 4 mainline directions, respectively, LOS is projected to generally degrade between 2001 conditions and 2030 No-Build conditions.

Table 2.1.6-6 summarizes level of service data for future SR 4 mainline conditions and shows the number of SR 4 segments in the study area that would be operating at stop-and-go conditions (LOS F), congested conditions (LOS E) or acceptable conditions (LOS D and better). See Appendix E for more detailed information.

Eleven segments of SR 4 mainline from Hillcrest Avenue to Loveridge Road were considered for the (2001) existing conditions. Analysis of future conditions included two additional segments to better assess the effects of the proposed project.

Table 2.1.6-6: Summary of SR 4 Levels of Service
(Number of segments of SR 4 operating at different levels of service)

Conditions	Westbound						Eastbound					
	A.M. Peak Hour			P.M. Peak Hour			A.M. Peak Hour			P.M. Peak Hour		
	LOS D or better	LOS E	LOS F	LOS D or better	LOS E	LOS F	LOS D or better	LOS E	LOS F	LOS D or better	LOS E	LOS F
Current[1]	3	0	8	7	2	1	11	0	0	4	1	6
2030 No Build[2]	0	2	11	2	2	9	6	5	2	3	3	7
2030 Build[2]	9	4	0	13	0	0	13	0	0	7	2	2

Note:
1. Eleven segments are considered for current (2001) conditions.
2. Thirteen segments are considered for 2030 conditions.

As shown in Table 2.1.6-6, in 2030 westbound in the morning peak under No-Build conditions, traffic and congestion would generally increase, with 11 of the 13 segments operating at LOS F and the remaining two segments at LOS E. Freeway segments already operating at LOS F would degrade further, while the two segments at the east end of the corridor in the vicinity of Hillcrest Avenue that currently operate at LOS B to C would deteriorate to LOS F. Only in the vicinity of the Loveridge Road Interchange would westbound conditions be projected to improve, and then only to LOS E. As noted previously, this improvement would be the result of the current SR 4 widening project west of Loveridge Road being finished.

Westbound in the evening peak, traffic and congestion would also increase with the result that, by 2030 under No-Build conditions, segments currently operating mostly at LOS A to C would degrade to LOS F. Only in the vicinity of the Loveridge Road Interchange would LOS be projected to improve to LOS D. In total, nine freeway segments would be operating at LOS F, two at LOS E and the remaining two at LOS D and LOS C, respectively.

During the evening peak eastbound, seven segments would operate at LOS F, three at LOS E and the rest at LOS D. In the eastbound direction, the critical evening peak traffic operations, which are currently at LOS F from Loveridge Road to L Street, are projected to degrade slightly under No-Build conditions. East of L Street, freeway segments that currently operate at LOS B to D would degrade to LOS D to E. In the morning peak, traffic operations that are currently LOS A to D are projected to degrade to LOS C to F.

Ramp Junctions: Traffic operations at freeway ramp junctions are also expected to deteriorate under 2030 No-Build conditions. Refer to Appendix E for details.

Weaving Sections: Under 2030 No-Build conditions, all weaving sections in the project area are projected to operate at LOS F in the westbound direction. In the eastbound direction, LOS D to E is projected for the morning peak while LOS E to F is projected for the evening peak. See Appendix E for more information.

Intersections—Level of Service Analysis and Definitions

Intersection operations were evaluated using two methods: the CCTA LOS procedures and software based on the *2000 Highway Capacity Manual (HCM)*. One exception was the analysis of the 2030 ramp intersections, for which only 2000 HCM results are reported. CCTA LOS is the methodology required by the CCTA for analysis of signalized intersections and is based on the volume-to-capacity (V/C) ratio for critical movements. The East County Action Plan sets a Traffic Service Objective of mid-range LOS D or better (traffic no greater that 85 percent of design capacity) on intersections along Suburban Arterial Routes of Regional Significance, which include SR 4, Buchanan Road, Delta Fair Boulevard, Somersville Road, Lone Tree Way-A Street, East 18th Street, and Hillcrest Avenue. The 2000 HCM procedures are based on the amount of delay experienced by the average user of an intersection. Appendix E describes the definitions for the two methodologies in Tables E-15, E-16 and E-17.

Although they use different criteria, the two LOS methodologies both rate the level of service of analyzed intersections from LOS A to LOS F. Qualitatively, these LOS ratings are similar to those discussed for the freeway segments, with A being the best and F being the worst. Generally, LOS D or better is considered acceptable.

Table 2.1.6-7 summarizes the levels of service of the intersections in the study area for both existing and future conditions. It shows the number of intersections in the study area operating at LOS F, LOS E and LOS D or better. The level of service is based on amount of delay, per the 2000 HCM procedures. Intersection levels of service are generally higher if rated under CCTA procedures, so the results shown in Table 2.1.6-7—which are based on the HCM method—present the "worst case." See Appendix E for more detailed tabulations.

Thirty intersections were studied for current conditions, and twenty-eight intersections were studied for 2030 conditions. The numbers differ because some intersections would be removed, e.g., at G Street, while new ramp intersections would be created under future conditions. These intersections are classified by whether they are located in the vicinity of five SR 4 interchanges or are further away (isolated). Under current conditions, there are 23 study intersections located at the interchanges while seven study intersections were isolated. Under 2030 conditions, there would be 19 intersections adjacent to the interchanges while nine would be isolated.

Intersections—Current Conditions

Traffic analysis was also conducted for intersections in the vicinity of SR 4 interchanges. Intersections were found to operate at LOS F in the vicinity of the following interchanges: Somersville Road, G Street, and A Street.

As shown in Table 2.1.6-7, the study estimated that for existing conditions, during the morning peak hour, only one of the 23 signalized intersections *at interchanges* studied would operate at LOS F

while three of the seven unsignalized intersections would operate at LOS F. All other intersections operated at LOS D or better. During the evening peak hour, one of the signalized intersections operated at LOS F; one unsignalized intersection operated at LOS E and another at LOS F. All the other intersections operated at LOS D or better. *Of the seven isolated intersections, three operated at LOS E or F during the morning peak hour and two during the evening peak hour.*

Table 2.1.6-7: Summary of Existing and 2030 Intersection Levels of Service –
(Number of intersections operating at different levels of service)

Conditions	A.M. Peak Hour			P.M. Peak Hour		
	LOS D or better	LOS E	LOS F	LOS D or better	LOS E	LOS F
	Intersections at Interchanges					
Current	22	0	1	22	0	1
2030 No Build [1]	11	4	4	11	3	5
2030 Build [1]	17	1	1	17	1	1
	Isolated Intersections					
Current	4	0	3	5	1	1
2030 No Build[2]	2	1	6	1	4	4
2030 Build[2]	3	2	4	6	1	2

Note:
1. Twenty three intersections at interchanges were considered for analyzing the existing situation and 19 intersections were considered for the 2030 conditions.
2. Seven unsignalized or isolated intersections were considered for analyzing existing conditions and nine were considered for 2030 conditions.

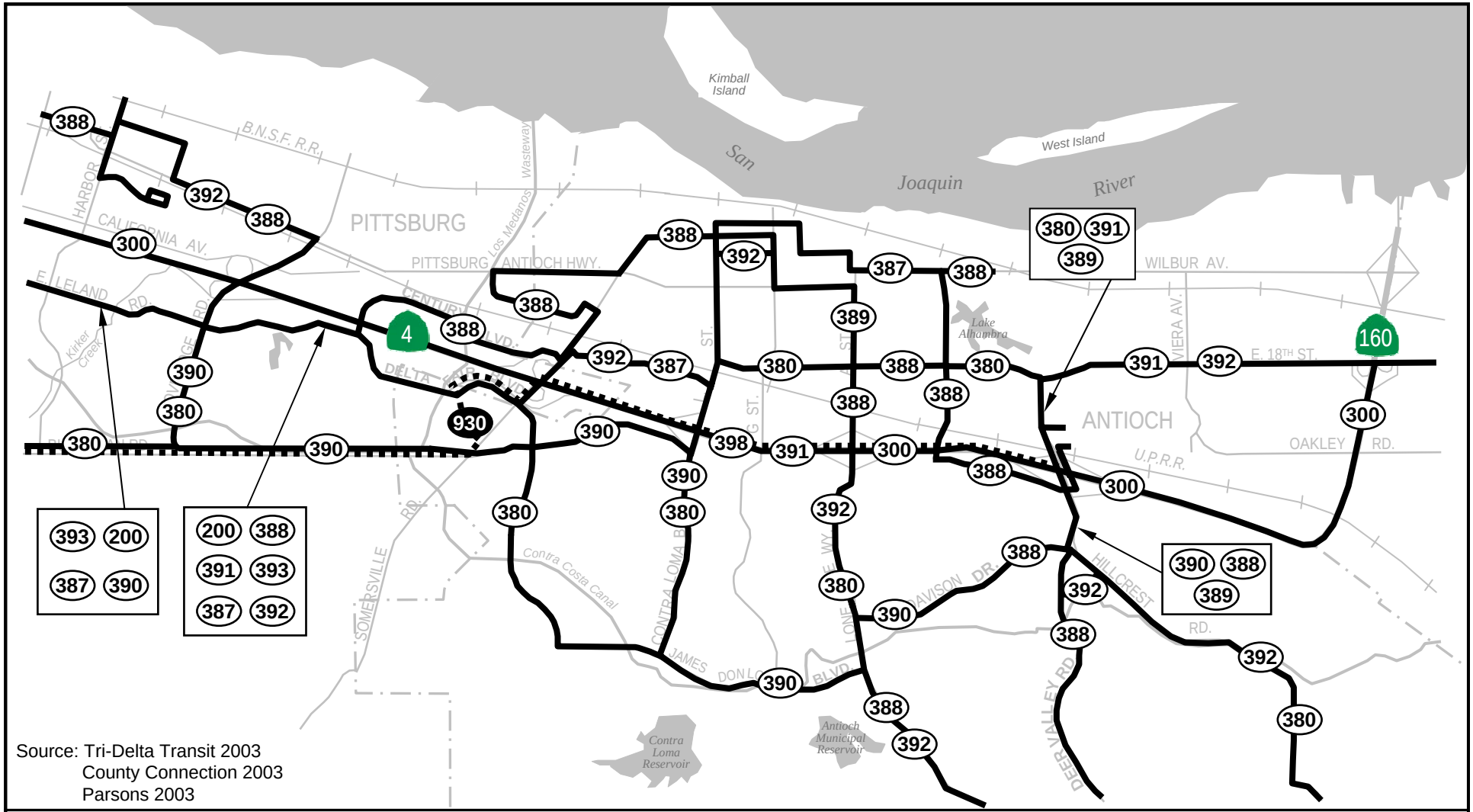
Intersections—2030 Conditions under the No-Build Alternative

Without capacity and operational improvements on SR 4, by 2030, conditions at the intersections near the freeway would deteriorate much further. By 2030, all five interchanges are projected to have some adjacent intersections that operate at LOS E or F. As shown in Table 2.1.6-7, of the 19 intersections, four would operate at F, and four at E during morning peak hour conditions and five would operate at F and three at E during evening peak hour conditions. All other intersections would operate LOS D or better. The worst conditions are expected to be in the western part of the study area adjacent to the Loveridge Road, Somersville Road, and L Street–Contra Loma Boulevard interchanges.

Of the nine isolated intersections only one would operate better than LOS E or F in at least one peak period in 2030. Of the eight intersections at E or F, six would operate at LOS F in at least one peak period.

Transit Network

Transit service in the SR 4 East project area consists of fixed-route bus service operated by Tri Delta Transit and County Connection as well as heavy rail BART service to the Pittsburg/Bay Point Station west of the project area and Amtrak. Figure 2.1.6-6 shows the bus routes within the project area.



Source: Tri-Delta Transit 2003
County Connection 2003
Parsons 2003

Legend:

380 — **Tri-Delta Transit** 380 **County Connection** **City Boundary** **Railroad**

N
NOT TO SCALE

Figure 2.1.6-6
STATE ROUTE 4 (EAST) WIDENING PROJECT: LOVERIDGE ROAD TO STATE ROUTE 160
04-CC-4-KP 37.9/R46.3 (PM 23.5/R28.8)

TRANSIT NETWORK

Tri Delta Transit

The Eastern Contra Costa Transit Authority (Tri Delta Transit) operates a total of 15 bus routes throughout Eastern Contra Costa County, running between Bay Point in the west and Brentwood in the east. Coverage includes the Hillcrest park-and-ride lot, Antioch Amtrak Station, Los Medanos College, SR 4/Railroad Avenue junction, and the Pittsburg/Bay Point BART Station. Four Tri-Delta bus routes use SR 4 within the project limits.

County Connection

The Central Contra Costa Transit Authority (County Connection) provides service in Central Contra Costa County with connections to Pittsburg and Antioch. County Connection Line 930 originates in Walnut Creek, traveling on Ygnacio Valley Road/Kirker Pass Road to Buchanan Road, and then travels along SR 4, to terminate at the Hillcrest park-and-ride lot in Antioch. County Connection has no immediate plans to increase bus service in the East County areas.

BART

BART currently provides regional passenger rail service between Central Contra Costa County and the Oakland/San Francisco area. During weekdays, scheduled trains complete 82 round trips between the Pittsburg/Bay Point Station west of the project area and other Bay Area destinations with an average weekday ridership of approximately 4,500. BART also provides express bus service between the Pittsburg/Bay Point Station, Antioch and Brentwood (Routes PE and PE1). BART's ultimate plans include extending transit service eastward in the SR 4 median to the vicinity of the Loveridge Road interchange and then within an existing UPRR team track right-of-way to continue along the existing Union Pacific Mococo Line right-of-way to a station in the vicinity of Hillcrest Avenue. Proposed station sites within the corridor include Railroad Avenue, Somersville Road, and Hillcrest Avenue.

Amtrak

Amtrak offers intercity-interregional service between Oakland and Bakersfield with eight daily stops at the Pittsburg-Antioch Station on First Street in Antioch.

Pedestrian Facilities

The existing pedestrian system within the project area provides adequate sidewalk and crosswalk connections in the vicinity of the SR 4 interchanges; however, sidewalk facilities at the freeway overcrossing and undercrossing locations are inconsistent. At all study area interchanges, sidewalks and crosswalks are provided at and near the overcrossing or undercrossing. Currently, pedestrian traffic within the project area is low.

Bicycle Facilities

Figure 2.1.6-7 illustrates current and planned bicycle facilities in the area. Bikeway classifications are defined in Table 2.1.6-8. Of the six study area interchanges, four currently have an on-street bikeway facility (Class II) at and near the overcrossing or undercrossing area. In addition, the Roosevelt pedestrian undercrossing and the Cavallo Road–Garrow Drive undercrossing are adjacent to a proposed on-street bikeway facility (Class II) on East Tregallas Road. The majority of the existing facilities begin south of SR 4 and extend northward, to terminate at SR 4. The Loveridge Road bike route is the only facility within the study area with its northern terminus north of SR 4. The existing bike paths and their limits are listed below.

- Loveridge Road between Buchanan Road and Pittsburg Waterfront Road.
- Contra Loma Boulevard between James Donlon Boulevard and SR 4.
- Lone Tree Way / A Street between James Donlon Blvd and SR 4.
- Hillcrest Boulevard between Prewett Ranch Road and SR 4.

James Donlon Boulevard, a Class II bikeway facility running parallel to SR 4, together with these four major bike paths, forms a continuous bike network to some major activity centers within the study area. The second bike trail that provides an east-west route through the area is the Delta De Anza Trail, an off-street Class I facility, which serves mainly recreational purposes and does not provide access to the majority of activity centers.

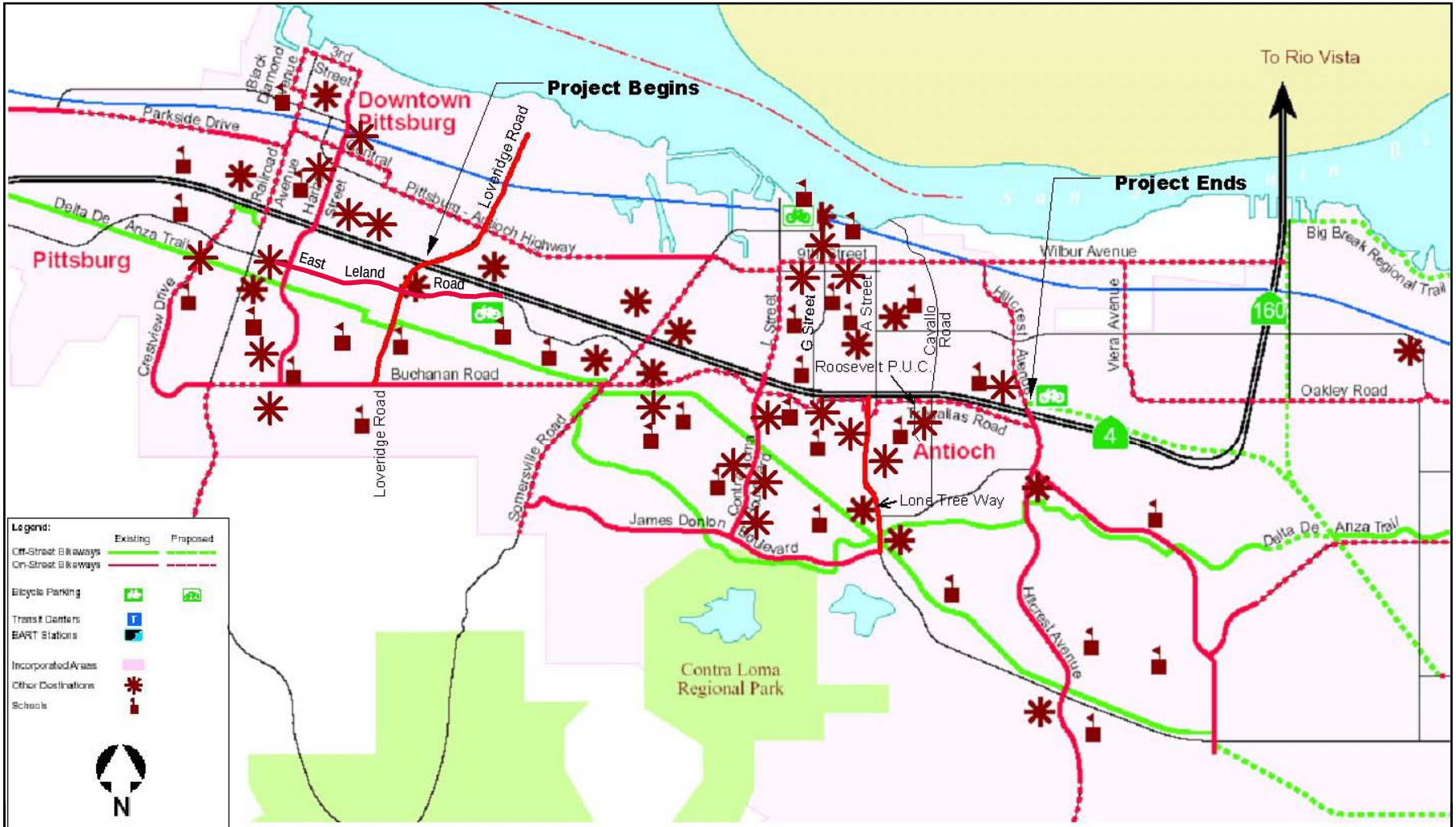
Table 2.1.6-8: Bikeway Classifications

Bikeway Class	Definition
Class I Bikeway (Bike Path)	Provides a completely separated right of way for the exclusive use of bicycles and pedestrians with crossflow minimized.
Class II Bikeway (Bike Lane)	Provides a striped lane for one-way bike travel on a street or highway.
Class III Bikeway (Bike Route)	Provides for shared use with pedestrian or motor vehicle traffic.

Source: Caltrans Highway Design Manual, July 1995.

Parking

Based on estimates from aerial photographs, Table 2.1.6-9 summarizes current off-street parking in the project vicinity that has some potential to be affected by the SR 4 project. A total of about 3,200 spaces are available at apartment areas, shopping centers, two hotels, other businesses, and a park-and-ride lot adjacent to SR 4.



Sources: Contra Costa Countywide Bicycle and Pedestrian Plan 2003 (Final), Contra Costa Transportation Authority, http://ccta.best.vwh.net/GM/download/County_Final.pdf.
City of Pittsburg
Modified according to the East Contra County Bikeway Plan 2001. (Modified by Parsons to include community facilities.)

Figure 2.1.6-7

STATE ROUTE 4 (EAST) WIDENING PROJECT: LOVERIDGE ROAD TO STATE ROUTE 160
04-CC-4-KP 37.9/R46.3 (PM 23.5/R28.8)

BICYCLE ROUTES AND COMMUNITY FACILITIES IN PROJECT CORRIDOR

N
NOT TO SCALE

2-47

Table 2.1.6-9: Current Parking Available in the SR 4 East Study Area

Location	Total Parking Spaces[1]	Location	Total Parking Spaces
The Floor Store	14	Public Storage	4
Motel 6	195	North Park Plaza	1,100
Lakeview Apartments	256	Pheasant Ridge Apartments	380
Kaiser Permanente	350	Hardy Nix Jewelers	214
Lyons Restaurant	48	Delta Bowl	186
Americas Tire Company	35	The Sporting Edge	20
Burger King - 2440 Mahogany Way	41	Ramada Inn	122
Bottoms Up Liquor	10	Arco Gas Station	15
Hillcrest PNR Lot	251	**Total**	3,241

[1] Estimate of existing parking based on a review of aerial mapping.
Source: Parsons 2003

2.1.6.2 Impacts

Section 2.1.6.1, Affected Environment, described the traffic congestion, delay, and other operational problems that would be expected to prevail under the No-Build Alternative. This section describes the anticipated effects of the Build Alternative. The long-term impacts of the SR 4 East Widening project on transportation and vehicular traffic would generally be positive because the project would reduce traffic delay on SR 4 and at the interchanges and surrounding intersections within the project area.

Future Year 2030 Peak-Hour Conditions on SR 4 with the Build Alternative

Future peak-hour impacts on SR 4 were rated according to the measures of effectiveness that were summarized in Table 2.1.6-5; these are discussed in the following paragraphs along with safety.

Travel Demand Served: The Build Alternative would substantially increase the ability of SR 4 to serve peak period travel demand. Total future travel demand is expected to be more or less the same as under the No-Build Alternative, but the increased capacity of SR 4 under the Build Alternative would enable more vehicles to be accommodated during the peak hour of extended peak periods. The increased peak-hour demand served does not imply an increase in daily traffic as a result of the project. It only means that due to the improved traffic operations in the SR 4 study area, less over flow or excess demand would need to spill over onto the shoulders of the peak hour. Thus the demand served during the peak hour would increase, but total peak period and daily travel demand would remain more or less the same.

The largest increases in demand served (gains of about 40 percent) would occur in the peak directions. The Build Alternative would serve 100 percent of the peak-hour demand, compared with only 85 percent of the peak-direction peak-hour demand and 90 to 95 percent of the off-peak direction peak-hour demand for the No-Build Alternative due to capacity constraints. This shortfall in demand served under the No-Build Alternative would lead to extremely long queues and extended periods of congestion in the corridor. The increased capacity under the Build Alternative (with a greater proportion of peak-hour demand served) would dramatically reduce the hours of congestion from 13 hours westbound and seven hours eastbound to less than one hour for each direction.

VKT: The Build Alternative would also carry additional peak-hour kilometers of travel compared with the No-Build Alternative, although the daily VKT for the whole network is expected to remain approximately the same, with or without the project. This phenomenon results from the same relationship between peak-hour and peak-period demand as explained previously.

Average Travel Time: As shown in Figure 2.1.6-8, the Build Alternative would reduce average travel times during all time periods. The most noticeable reduction would occur for peak directional travel times, which would decrease by about 50 percent compared to the No-Build Alternative.

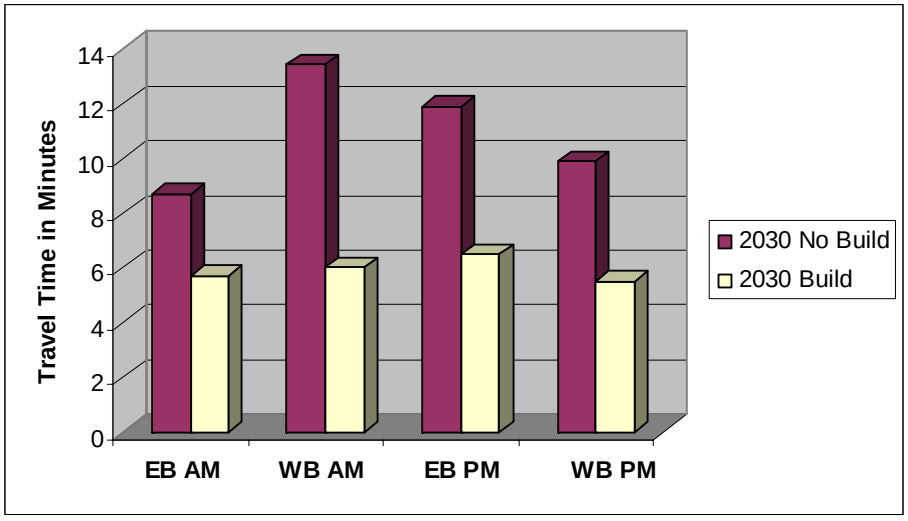
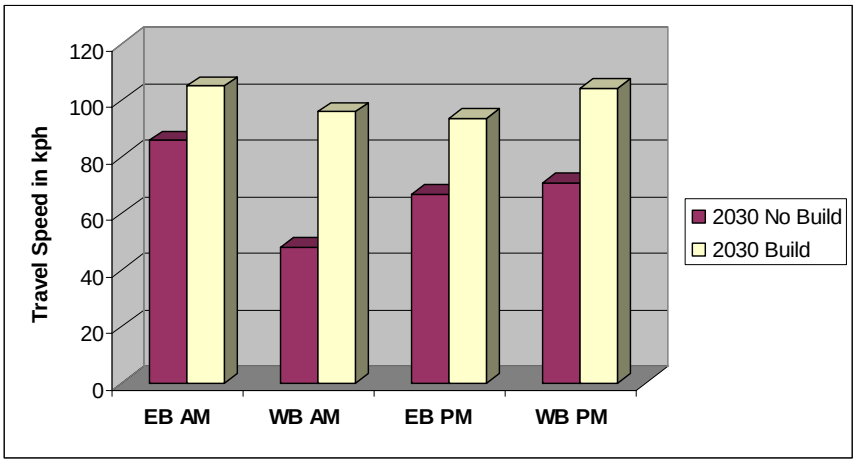


Figure 2.1.6-8: Travel Time along SR 4 Study Area during Peak Periods – 2030 No-Build and Build Conditions

Average Travel Speed: Consistent with the findings for average travel times, the Build Alternative would increase average travel speeds for all time periods as shown in Figure 2.1.6-9. The Build Alternative would increase the average morning westbound travel speed from a stop-and-go speed of 48 kph (30 mph) under the No-Build Alternative to 96 kph (60 mph). The Build Alternative would increase the average evening eastbound travel speed from a stop-and-go speed of 67 kph (42 mph) under the No-Build Alternative to 94 kph (58 mph).



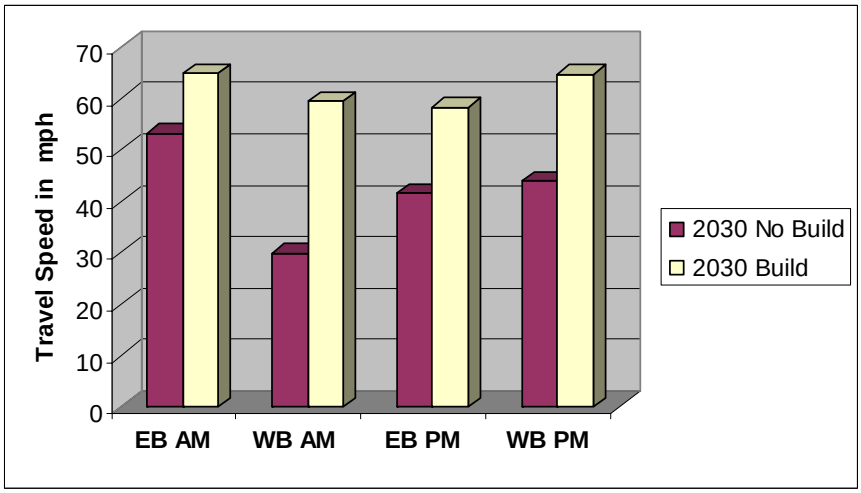


Figure 2.1.6-9: Travel Speeds (kph and mph) along the Study Area during Peak Periods – 2030 No-Build and Build Conditions

Vehicle Delay: Compared to the No-Build Alternative, the Build Alternative would decrease vehicle delay in the peak directions by about 80 percent. This translates to 7.4 minutes of travel time savings for westbound motorists in the morning and 5.4 minutes of travel time savings for eastbound motorists in the evening.

Duration of Congestion: Without any improvements to SR 4, congestion in the westbound direction is expected to increase from the current level of three to four hours to 13 hours by 2030, essentially all day through both the morning and evening peak periods, as shown in Figure 2.1.6-10. The Build Alternative would contain congestion to within the peak hour for both peaks.

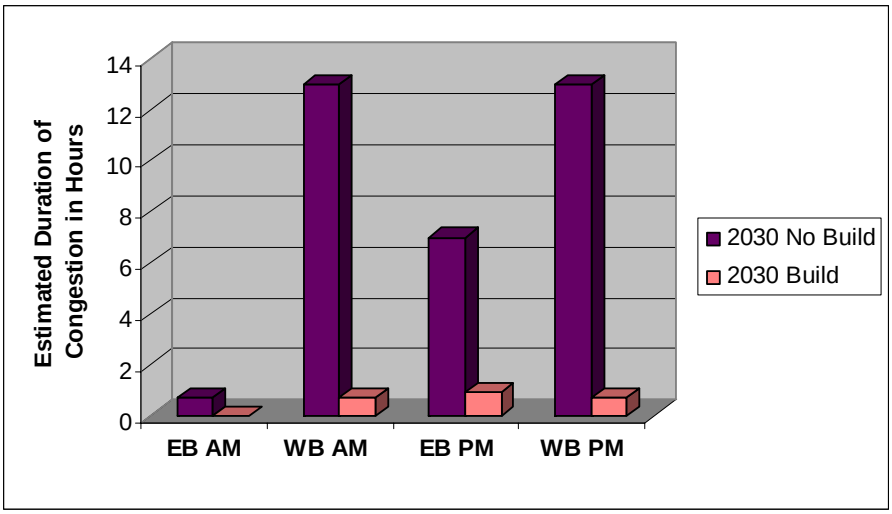


Figure 2.1.6-10: Estimated Duration of Congestion in the Study Area during Peak Periods – 2030 No-Build and Build Conditions

Local Traffic Diversion: The Build Alternative would result in a reduction in local traffic diversion to the parallel arterials of Buchanan Road and Pittsburg-Antioch Highway, with reductions of about 25 percent for peak travel directions.

Length of Critical Queue: The Build Alternative would substantially reduce the overall length of critical queue in all directions as compared to the No-Build Alternative, nearly eliminating all queues. What this would mean in practical terms is that the Build Alternative would improve SR 4 operations in the project corridor to largely smoothly flowing traffic. In contrast, the No-Build Alternative would result in 17-kilometer (11-mile) queues westbound and 12-kilometer (8-mile) queues eastbound that would take most of the day to dissipate.

Level of Service: As shown in Table 2.1.6-6, compared to 2030 No-Build conditions, LOS would improve under 2030 Build conditions. In the evening eastbound direction, each SR 4 segment evaluated would operate at LOS E or better, except for two segments, between the Somersville Road on-ramp and Contra Loma Boulevard–L Street and L-Street off- and on-ramps. There would still be a queue starting at L Street under the 2030 Build condition, but the length of the queue would be reduced substantially compared to the length of queue under No-Build conditions. In the morning westbound direction, operations would be maintained at LOS E or better, with two-thirds of the evaluated SR 4 segments operating at LOS D or better. In the morning eastbound direction, every segment would operate at LOS C or better, with all but one segment at LOS B. In the evening westbound direction, operations would be maintained at LOS D or better, with 11 of the 13 segments at LOS C or better. See Appendix E for more information.

Ramp Junctions: With the Build Alternative, operations of all ramps evaluated for this study are expected to remain the same or improve compared to No-Build conditions in 2030. The Build Alternative would improve operations between Loveridge Road and L Street during the evening peak from LOS F to LOS E or LOS D. The L Street ramp junctions would still operate at LOS F. The Build Alternative includes provisions for future ramp metering that could improve the operation of the ramp junctions, although operations at the ramp termini intersections would likely degrade somewhat. See Appendix E for more information.

Weaving Sections: Under the Build Alternative, operations of all westbound locations are expected to remain the same or improve compared to the No-Build condition in 2030. In the eastbound direction, operations would improve or remain the same under the Build Alternative as compared to the No-Build Alternative for all locations except the section between L Street and A Street during the evening peak hour. In this case, operations would worsen to LOS F due to the increased demand at the L Street on-ramp. See Appendix E for more information.

Safety: Improvements proposed under the Build Alternative would be expected to reduce the frequency of accidents along SR 4 within the project limits. Providing an eight-lane divided facility would reduce congestion relates to more frequent rear-end and sideswipe accidents. Proposed auxiliary lanes would facilitate safer merging movements to and from the freeway. In addition, the frequency of accidents involving hit objects is expected to decrease because standard shoulders and flatter horizontal curves would be provided in the proposed facility.

Intersections

Conditions at all nine isolated intersections considered for this study would also either actually improve or would at least avoid the degradation predicted under No-Build conditions. For intersections near interchanges (Table 2.1.6-7), under No-Build conditions all interchanges would be projected to have some related intersections that operate at LOS E or F. Under Build conditions, only one intersection near the Hillcrest Avenue interchange would operate at LOS F and one intersection each near Hillcrest Avenue and L Street/Contra Loma Boulevard Interchange would operate at E. Generally there would be improvement at all locations; where some degradation in LOS is anticipated, the resulting LOS would still be C or better. The only exception is at Hillcrest Avenue where the intersection of the SR 4 eastbound ramps and Hillcrest Avenue would operate at LOS E or C under No-Build conditions and at LOS F under Build conditions. A variety of project modifications were tested for their ability to improve LOS at this location, but none was effective. This impact at this one location is not considered to be substantially adverse, however, given the dramatic level of improvement to other SR 4 mainline and intersection traffic operations from the Build Alternative. This determination is explained in detail in the next paragraph.

LOS F would occur at Hillcrest Avenue for all interchange improvements analyzed. This impact would occur because the additional mainline capacity provided by the Build Alternative would enable more traffic to reach the Hillcrest Avenue interchange during the peak hour. Under the No-Build Alternative, mainline congestion would be so severe that a substantial proportion of the traffic destined for the Hillcrest Avenue Interchange would not be able to access it during the peak hour.

Under the Build Alternative, an additional approximately 1,200 evening peak-hour vehicles would be able to use the eastbound off-ramp of the Hillcrest Interchange – traffic that could not be served under the No-Build Alternative. This overflow traffic would cause a variety of other congestion-related problems that would affect not only this interchange but the SR 4 mainline, as shown in Table 2.1.6-5.

Transit and HOV

The proposed project would improve conditions for local and express bus service on SR 4. Under the Build Alternative, Tri-Delta routes 300, 388, 391, and 398 and County Connection route 930 would operate at free flow speeds in the new HOV lanes through the project area instead of at 48 to 66 kph (30 to 42 mph) in congested mixed flow lanes under the No-Build Alternative. Not only would transit travel time be reduced, but transit schedule reliability would be improved. Carpools and vanpools also would have improved speeds and reduced travel times, providing incentive to rideshare.

Pedestrian and Bicycle Facilities

It is expected that the overall safety and accessibility of the SR 4 corridor and adjacent roadway network for both pedestrians and bicyclists would be facilitated as a result of the following improvements under the SR 4 East Widening Build Alternative.

- Provision of continuous sidewalks and crosswalks on both sides of roadway.
- Installation of additional traffic control devices for both pedestrian and vehicular movements.
- Widening of overcrossings and undercrossings to accommodate future bicycle routes now impractical on existing narrow sections.
- Provision of pedestrian crossing islands at wide intersections with multiple lanes.

Americans with Disabilities Act (ADA)-compliant facilities would be provided at every interchange.

Parking

As reported by Table 2.1.6-10, it is estimated that 276 parking spaces within the proposed project right-of-way would be removed by the Build Alternative. The highest proportion of spaces would be removed at the Hillcrest Avenue BART park-and-ride lot and Bottoms Up Liquor, at 100 percent and 30 percent, respectively. In addition, approximately 310 other business parking spaces would be removed along with the 20 businesses affected; about 122 of the lost spaces would be located at the Ramada Inn at the SR 4 / Somersville Road interchange. These businesses would be relocated.[5]

[5] The City of Antioch is currently trying to develop Somersville Road interchange options that would avoid taking the Ramada Inn. If this effort succeeds, the parking impact at the Inn would be mitigated.

Table 2.1.6-10: Estimated Parking Spaces Removed by Build Alternative

Location	Total Parking Spaces	Projected Spaces Removed	Location	Total Parking Spaces	Projected Spaces Removed
Motel 6	195	10	Arco Gas Station	15	2
Bottoms Up Liquor	10	3	Pheasant Ridge Apartments	380	10
Hillcrest Park and Ride Lot	251	251	**TOTAL**	**851**	**276**

Source: Parsons 2003

2.1.6.3 Avoidance, Minimization, and Compensation Measures

Because conditions at all isolated nine intersections would be the same or better than under No-Build conditions and because these intersections are outside the project limits, no additional project modifications are proposed. Motel 6 and Bottoms Up Liquor would still have adequate parking by the standards of the cities of Pittsburg and Antioch, respectively, so replacement or compensation measures are not proposed. The Hillcrest Avenue BART park-and-ride lot would be relocated. Caltrans and CCTA will work with the City of Antioch to explore options for relocating the Hillcrest Avenue BART park-and-ride lot. *Caltrans and CCTA will coordinate with BART also to assure that the replacement park-and-ride facility is consistent with BART Access Policies and that it meets the needs of the East County park-and-ride lot users the facility is to serve. A site will be identified for the relocated park-and-ride lot before construction for the SR 4 (East) Widening Project would affect the existing park-and-ride facility at Hillcrest. Caltrans' intent would be to locate a site adjacent to or within Caltrans right-of-way and avoid displacement impacts and impacts to surrounding land uses. If it appears that the available sites would have such impacts, CCTA and Caltrans would undertake additional environmental impact assessment if appropriate.*

Parking for the Arco Gas Station was reconfigured to increase the total resulting parking above the minimum required by the City of Antioch; no additional mitigation is proposed. The Pheasant Ridge Apartments appear to have less than the usual minimum number of spaces; the ten spaces that would be removed for this project would be replaced. Caltrans and CCTA will develop options for replacing the ten lost spaces. A vacant parcel on the east side of the apartment area is a potential parking replacement site.

2.1.7 Visual/Aesthetics

This section assesses the visual affects of the Build Alternative. The visual analysis characterizes the SR 4 (East) corridor in terms of "view locations," which represent distinct segments that have a consistent or cohesive visual or physical character. This characterization identifies existing visual conditions within the corridor segments. In addition, physical changes attributable to the Build Alternative 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 minimize visual effects are described in Section 2.1.7.4.

A visual change would be considered adverse if it introduced obtrusive elements substantially out of character with existing land uses or substantially obscured a scenic view or vista available to sensitive receptors in the vicinity of the proposed project. Viewer groups are corridor residents and business occupants, recreational users of parks and preserved natural areas, motorists, pedestrians, and students of schools in the vicinity of the proposed project facilities.

2.1.7.1 Regulatory Setting

NEPA establishes that the federal government use all practicable means to ensure all Americans safe, healthful, productive, and aesthetically 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, 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)]

2.1.7.2 Affected Environment

The SR 4 corridor is located about five miles east of SR 242 in Concord and runs about six miles between the cities of Pittsburg and Antioch. Between the western and eastern project limits, SR 4 passes through generally flat terrain and is flanked by mixed commercial, light industrial, and residential development. The western end of the project passes through more mixed commercial and industrial land uses, the central segment contains more residential development, and sparsely developed rolling hills dominate the eastern end of the corridor. Long range views from the roadway are generally obscured by buildings, mature vegetation, and other roadside conditions. The Sacramento River and San Francisco Bay inlet about a mile north of SR 4 are not visible from the highway. In several locations, SR 4 runs along an embankment 0.3 m (1 ft) to 6 m (20 ft) above surrounding development; in other locations, the roadway is in cut and the surrounding development is on higher ground. In these areas, the roadway could be as much as 6 m (20 ft) below surrounding development. Sound walls and mature vegetation currently screen views of SR 4 from surrounding

residences. It is anticipated that as a result of the proposed widening improvements, all residential areas would be shielded from the highway by sound walls.[6]

Existing transportation facilities, including the freeway and associated interchanges, are the dominant visual elements along the SR 4 (East) Widening Project corridor. Commercial, light industrial and residential land uses are situated adjacent to the freeway at various locations along both sides of the central segments of the corridor. Natural landforms are largely absent as the existing grades have been modified to accommodate the freeway. Interchanges are closely spaced, heightening the sense of an urban corridor. The existing landscape consists of typical freeway plantings, trees and shrubs.

The existing landscape in the eastern portion of the corridor includes a substantial number of naturalized and non-irrigated plants, and the ground cover consists primarily of non-native grasses that are brown for much of the year. Panoramic views and rural grassy hills are visible elements that contribute to a rural or 'urban edge' character.

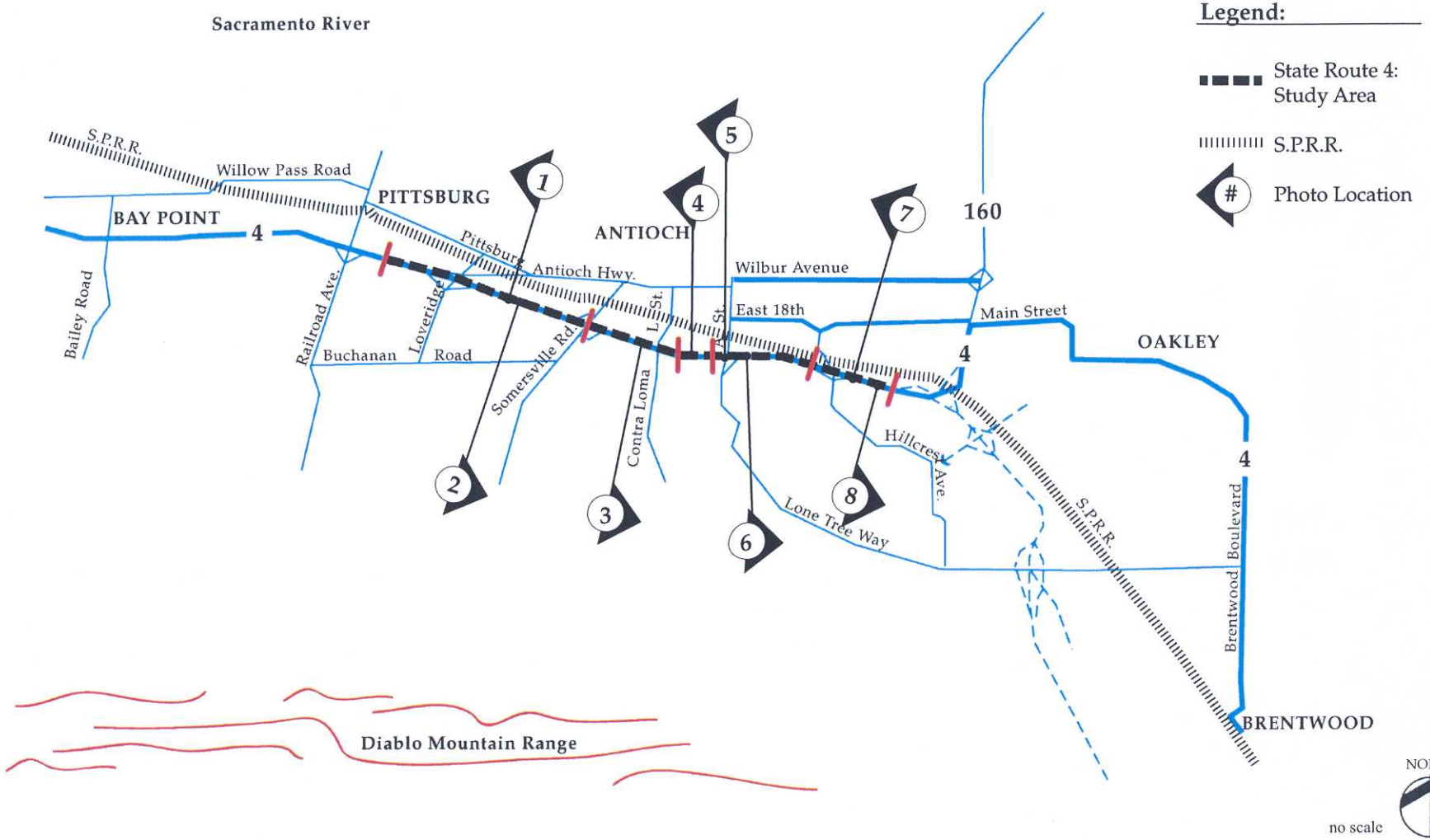
Two segments of the SR 4 (East) Widening Project corridor are designated as "Landscaped Freeway." The California Code of Regulations defines a landscaped freeway as the following:

"1,000 feet of continuous planting measured on one side of the highway, or a combination of plantings on both sides; ornamental vegetation is present and healthy; plantings primarily improve the aesthetic appearance of the freeway; spacing in plantings must be less than 200 feet; plantings should receive reasonable maintenance; and the segment must be certified by a licensed landscape architect."

Existing Visual Character of Corridor by View Location and Segment

Existing visual quality along the SR 4 (East) project corridor is described below by view locations and segment. View locations are identified on Figure 2.1.7-1.

[6] Route 4 East Corridor Visual Design Guidelines, CCTA (Draft, April, 2003).



View Locations

Route 4 (East) Widening

Callander Associates
Landscape Architecture, Inc.

Figure 2.1.7-1

View Locations 1 and 2: Western Project Terminus to Somersville Road. Visual quality along this segment is characterized by foreshortened views to the south, due to industrial and commercial development and vegetation, with some distant views toward the north. As shown in Figure 2.1.7-2, views from SR 4 to the north are foreshortened by industrial and commercial development adjacent to the corridor. Monument signs and utility towers are visible from a distance. Distant views of the Diablo hills may be seen on the horizon by motorists traveling west.

Figure 2.1.7-2: View Location 1 – Western Terminus to Somersville Road (Westbound)

Views of commercial storage facilities and residential development along the south side of SR 4 are generally buffered by vegetation. Intermittent views to the south, over undeveloped fields, as shown in Figure 2.1.7-3, provide mid-range views to and from residential developments.

Figure 2.1.7-3: View Location 2 – Western Terminus to Somersville Road (Eastbound)

View Location 3: Somersville Road to West of Contra Loma – G Street. Visual quality along this segment, as shown in Figure 2.1.7-4, is characterized by consistent, thick tree vegetation along both sides of the corridor. Dense, mature trees and bushes buffer most views from the corridor and screen views of SR 4 from homes and businesses along the corridor. Motorists have no distant views. A residential development is visible on the south side, just west of the embankments for the Contra Loma Boulevard overpass.

Figure 2.1.7-4: View Location 3 – Somersville Road to Contra Loma/G Street (Eastbound)

View Location 4: Contra Loma – G Street to G Street – A Street. A change in topography occurs along this segment due to the high embankments of the Somersville Road underpass (See Figure 2.1.7-5). Views of and from the freeway corridor are confined by the steep embankments. Thick tree vegetation and green, vegetated ground cover is present along both sides of the corridor. Some residential development is visible on the south side, just east of the embankments for the Contra Loma Boulevard overpass.

Figure 2.1.7-5: View Location 4 – Contra Loma/G Street to G Street/A Street (Westbound)

View Locations 5 and 6: G Street – A Street to Hillcrest Avenue – Garrow Street. Views along this segment are generally foreshortened due to dense ornamental and other irrigated plantings, which also screen most views of the roadway for surrounding residents and businesses. Motorists traveling westbound, as shown in Figure 2.1.7-6, have distant views towards the Diablo hills and intermittent views of residential rooftops. Electric transmission towers and street lighting fixtures are visible from the corridor in both the westbound and eastbound directions (See Figure 2.1.7-7).

Figure 2.1.7-6: View Location 5 – G Street/A Street to Hillcrest Avenue/ Garrow Street (Westbound)

Figure 2.1.7-7: View Location 6 – G Street/A Street to Hillcrest Avenue/Garrow Street (Eastbound)

View Locations 7 and 8: Hillcrest Avenue – Garrow Street to Eastern Project Terminus. Visual quality along the eastern segment of the corridor is characterized by non-irrigated landscape, with rural open views and rolling hills. The views from the corridor are panoramic, with distant views of residential and Delta areas. Electric transmission towers and a substation are dominant visual elements in the landscape, as shown in Figure 2.1.7-8. There are very few sensitive receptors along this section of SR 4.

Figure 2.1.7-8: View Location 7 – Hillcrest Avenue/Garrow Street to Eastern Project Terminus (Westbound)

There is sparse development with very few sensitive receptors along the eastern end of the project corridor, with scattered clusters of mature vegetation. As shown in Figure 2.1.7-9, views from the corridor consist of rolling grassy, rural hills with intermittent trees.

Figure 2.1.7-9: View Location 8 – Hillcrest Avenue/Garrow Street to Eastern Project Terminus (Looking East)

2.1.7.3 Impacts

The SR 4 (East) Widening Project would have no substantial adverse effect on scenic vistas or resources, would not substantially degrade the existing visual character or quality of the corridor, and would not create a new source of substantial light or glare. Scenic vistas in the corridor generally do not exist and there are no scenic resources. Visual changes due to the project would be consistent with the existing visual character and quality of the roadway corridor. Lighting associated with the improved facility would be comparable to that of the existing SR 4 corridor.

Construction of the project would result in visual changes due to widening of the roadway, construction of auxiliary lanes, reconstruction of structures and crossing roadways, and interchange

improvements. The alignment of the widened mainline would be shifted southward of the existing right-of-way west of Loveridge Road, northward between Loveridge Road and Century Boulevard, and remain within the existing right-of-way for the remainder of the project corridor. Interchange improvements would exceed the existing right-of-way at five locations. At three interchange locations, the SR 4 vertical alignment would deviate from the existing profile.

In addition, the Build Alternative would construct retaining walls throughout much of the corridor to minimize new right-of-way requirements. Sound walls proposed to mitigate noise impacts at residences along the corridor would be visually apparent and would obstruct views of and across the roadway from residences and from the roadway to residences. Lines of sight to truck exhaust stacks would also be blocked for these residential receptors. Increased shading of residential properties at some locations may result at some residential locations due to construction of sound walls.

Some mature vegetation, consisting of freeway trees and other freeway planting, would be removed. An estimated 1,020 to 1,140 highway trees, representing 68 to 76 percent of the existing highway trees, may be affected by the project. These plantings would be replaced in accordance with Caltrans' guidelines and the SR 4 *Corridor Visual Design Guidelines*. Proposed retaining and sound walls would limit opportunities for replacement planting alongside the roadway. The interchange areas provide the most scope for implementation of the planting concepts. The goals of the proposed planting concepts are as follows:

- Blend into the character of the surrounding landscape (particularly where large areas of existing freeway plantings will be retained);
- Respond to the expanded physical features of the project;
- Preserve 'landscaped freeway' designations where they currently exist; and
- Promote sustainable landscape improvements to reduce maintenance requirements.

Planting concepts and aesthetic treatments would generally fall into two broad categories: those proposed for the central segments of the SR 4 (East) corridor where numerous retaining and sound walls are proposed as described in the following paragraph, and those proposed for the western and eastern segments, where development densities are less and there are fewer sensitive receptors.

Central Segment Visual Impacts and Proposed Planting Concepts

Widening in the central segments of the corridor would require extensive use of retaining walls and sound walls. A new barrier would be constructed in the median. Some existing mature vegetation would be removed and would be replaced with similar trees and tree spacing where required to preserve the 'landscaped freeway' designation. Ground cover would be replaced with similar plant species. Vines would be planted to climb the side of proposed sound walls opposite the roadway to soften their appearance as viewed from the residences. In time, these vines would grow over the roadway side of the wall. Vines would also reduce the likelihood of graffiti and minimize maintenance associated with graffiti removal. Most new plantings would be maintained with overhead irrigation systems, while vines planted at walls would be established with bubblers. Visual Simulation – Westbound on SR 4 towards G Street Overcrossing (Station 298+00), as described

below and shown in Figure 2.7.1-10, depicts a typical planting plan for areas within the central segment.

West Approach to G Street/Mina Interchange (Station 298+00). This location in the central segment of the SR 4 (East) corridor, as shown in Figure 2.7.1-10, would contain a new retaining wall on the south side and an embankment with a new sound wall on the north side. A new barrier would be constructed in the median. The general visual character for this segment after widening is of a broader, more panoramic highway. On the south side, many existing trees would be preserved. Trees would be added to match the existing planting type and fill in landscaping gaps. Ground cover would be planted to match the existing ground cover. The proposed sound wall would be 4.9 m (16 ft) high and be set back from the freeway on both sides and planted with vines on the side opposite the roadway. In time, these vines would grow over the roadway side of the walls. With the new facilities and plantings as proposed, no adverse impact would result.

Western/Eastern Segments Visual Impacts and Proposed Planting Concepts

The western and eastern segments of the SR 4 corridor are less densely developed and therefore fewer sound walls are needed. The objective of the proposed planting concepts along these segments is to blend in with the natural character of the existing landscaping where it is a vivid aspect and to soften roadside industrial and commercial development and roadway facilities where they are dominant. Trees would be added intermittently to replicate the spacing of existing trees that would be removed. The ground plane would be largely untouched except where grading operations would result in exposed earth. Hydroseeded grasses are proposed to blend in with the surrounding grasses. Trees would be established with bubblers and the grasses would be established with normal rainfall; no overhead irrigation is proposed. The planting concept proposed along these segments is typified in Figure 2.7.1-11: Visual Simulation – Westbound on SR 4 towards Hillcrest Avenue Overcrossing (Station 325+00), as described below.

West Approach to Hillcrest Avenue (Station 325+00). At this location along SR 4, as shown in Figure 2.7.1-11, traveling west towards the Hillcrest Avenue overpass, the motorist's view broadens. Two bridges currently exist at this location. The Hillcrest Avenue southbound bridge that would be replaced is hidden from view. The existing slopes would be largely retained through the use of retaining walls on both sides of the highway. As a result, much of the existing landscaping would be preserved. A new barrier in the median would be constructed. A 3.7 m (12 ft) high sound wall on the south side (approx. Station 327+00), located on the grade above the retaining walls, would be vine covered. This would augment the landscape buffer along the highway corridor. New planting would complement the existing plantings, by emulating the open, rural, native landscape appearance. With the new facilities and plantings as proposed, no adverse impact would result.

Visual Simulation - Westbound On SR 4 Towards G Street Overcrossing (STA 298+00)

Route 4 (East) Widening

Callander Associates
Landscape Architecture, Inc.

Figure 2.1.7-10

Visual Simulation - Westbound On SR 4 Towards Hillcrest Avenue Overcrossing (STA 325+00)

Route 4 (East) Widening

Callander Associates
Landscape Architecture, Inc.

Figure 2.1.7-11

2.1.7.4 Avoidance, Minimization and Compensation Measures

The following measures would guide the planting concepts and hardscape aesthetic design treatments:

- Existing plantings would provide the basis for the replacement planting palette:
  - Deciduous Trees: Sawleaf Zelkova, Black Locust, Lacebark Elm
  - Evergreen Trees: California Pepper, Camphor Tree, Canyon Live Oak, Coast Live Oak
  - Ground Cover: Iceplant, Engish Ivy, Hall's Honeysuckle
  - Vines: Creeping Fig, Virginia Creeper, Boston Ivy
- Irrigation
  - Central Segment – All new plantings would be maintained with overhead irrigation systems.
  - Western/Eastern Segments – Trees established with bubblers; grasses established with normal rainfall.
  - Sound walls – Vines established with bubblers.
- Replacement planting would be adequate to preserve the 'landscaped freeway' designation.
- Sustainability – plant selection and density to reduce maintenance requirements.

It is anticipated that hardscape aesthetic design treatments such as block surface textures and end treatments of sound walls, slope paving treatments, and color would be provided in accordance with the *Route 4 East Corridor Visual Design Guidelines* (Draft, April, 2003). Such treatments would soften the appearance of the highway elements such as bridge structural elements and slope paving, minimize the perceived height and bulk of sound walls and retaining walls, mitigate the effects of large plain expanses, and unify the overall look of the roadway corridor from both the motorist's and residents' points of view. Implementing aesthetic design treatments as follows would improve corridor aesthetics and avoid substantial adverse impacts:

- Color palettes for block walls and slope paving under bridges would conform to the *Corridor Visual Design Guidelines.*
- A "rolling hill and wave" pattern theme has been adopted for aesthetic treatments by the cities of Pittsburg and Antioch; it is anticipated that this motif will be applied in combination with a fractured fin form texture to vertical and sloped surfaces such as sound wall surface treatments, retaining walls, on bridge parapets, and for slope paving under bridges.
- Medallions incorporating the logos of the cities of Pittsburg and Antioch would be included in surface treatments at bridge structures, retaining walls, and sound walls, subject to Caltrans concurrence.

2.1.8 Cultural Resources

2.1.8.1 Regulatory Setting

A cultural resources investigation was conducted in accordance with Section 106 of the National Historic Preservation Act and the implementing regulations of the Advisory Council on Historic Preservation (36 CFR 800). In addition, archaeological and historical resources have been evaluated in accordance with the State of California cultural resource regulations as provided in the California Environmental Quality Act (CEQA) and California Public Resources Code (PRC) Section 5024.

Caltrans, in consultation with FHWA and the State Historic Preservation Office (SHPO), delineated two Areas of Potential Effects (APEs). The APE for archaeological resources comprises the maximum area of construction, proposed right-of-way, or project "footprint" for the alternatives considered in this EA/IS. The APE for historic architectural resources includes the project footprint and also the first row of parcels fronting along the proposed project right-of-way.

If a parcel is both large and empty, the historic architectural APE includes the portion of the parcel adjacent to the right-of-way. Likewise, in the case of a linear resource crossing many parcels before crossing the project right-of-way, the historic architectural APE includes the portion of the parcel adjacent to the right-of-way.

A Historic Property Survey Report (HPSR) that identifies and summarizes eligible and cultural resources within the area was submitted to the SHPO on June 22, 2004. No historic resources meeting eligibility criteria for the National Register of Historic Places (NRHP) or California Register of Historic Resources (CRHR) were identified within the architectural APE. No archaeological resources were identified within the archaeological APE. The SHPO concurred with this determination on July 22, 2004. This letter of concurrence is included in Section 3.3, Correspondence.

2.1.8.2 Affected Environment

Archaeological Resources

Archival research was conducted in September 2001 and September 2002 to develop a historic context and to assess sensitivity for intact buried historic and prehistoric archaeological resources.

A pedestrian field survey of accessible portions (approximately 85 percent) of the archaeological APE was conducted in September 2001. The remaining 15 percent of the APE was either road surface or private property for which access was not granted. An expanded area records search and geomorphologic sensitivity analysis of the archaeological APE was conducted in August 2003. Subsurface testing was conducted on April 22, 2004. The geomorphological sensitivity analyses and subsurface testing confirm that the project area is not sensitive for prehistoric resources.

One historic archaeological resource, a refuse scatter, was found to be present within the archaeological APE. This refuse scatter does not retain integrity nor meet the significance criteria of the National Register of Historic Places (NRHP).

Historic Architectural Resources

A total of 185 legal parcels within the historic architectural APE were constructed in 1957 or before. Of this survey population, 175 resources are buildings or groups of buildings, and 10 are structures. There were no objects that dated to 1957 or before. There are 260 legal parcels within the APE that contain buildings, structures, or objects that were built in 1958 or later, as well as 67 vacant parcels. These 327 parcels are exempt from further evaluation in accordance with the Caltrans Section 106 Programmatic Agreement (Attachment 4, 2003) and have been reviewed by Caltrans professionally qualified staff.

Fieldwork and research for this project was conducted between February and July 2002 and during November 2003. All buildings and structures within the historic architectural APE that were built in 1957 or before were inventoried and evaluated; none of these buildings or structures meet the criteria for eligibility to the NRHP.

2.1.8.3 Impacts

Archaeological Impacts

A reasonable level of effort including a thorough and systematic subsurface testing program has been conducted to establish the likelihood of encountering buried cultural resources during construction of the SR 4 (East) Widening Project. Based on the information collected during field surveys, documentary research, and subsurface testing, it is not anticipated that construction activities would encounter or disturb cultural resources.

Historic Architectural Impacts

No resources within the project's Historic Architectural APE are eligible for the National Register. Therefore, there is no potential for impacts to such resources and no mitigation is proposed.

2.1.8.4 Avoidance, Minimization, and Compensation Measures

In the unlikely event that previously unidentified cultural materials are unearthed during construction of the proposed project, Caltrans and FHWA would comply with 36 CFR 800.13 regarding late discoveries.

2.2 Physical Environment

2.2.1 Hydrology and Floodplain

A Preliminary Hydrology Study (McGill Martin Self, Inc., June 2004) was prepared for the project and the following sections summarize its findings.

2.2.1.1 Regulatory Setting

The project traverses the cities of Pittsburg and Antioch located within the northeast quadrant of Contra Costa County. The western project limits fall within the City of Pittsburg, which is currently undertaking a project to improve the downstream capacity of Kirker Creek. The eastern project limits fall within the City of Antioch. Local agency approvals are required for construction of any proposed improvements involving culvert crossings of SR 4.

2.2.1.2 Affected Environment

The study area is located in the Kirker Creek, Markely Creek, West Antioch Creek, and East Antioch Creek watersheds. Surface waters in the project area consist of West Kirker Creek, East (or Old) Kirker Creek, Los Medanos Wasteway (also referred to as the Contra Costa Canal), Markley Creek, West Antioch Creek, and the east tributary of East Antioch Creek.

These water bodies and respective watersheds predominately flow northerly, from the foothills of Mount Diablo, crossing SR 4, and continuing north to the New York Slough into Suisun Bay.

FEMA Floodplain Designations

The Flood Insurance Study and Flood Insurance Rate Maps (FIRM), prepared by the Federal Emergency Management Agency (FEMA) for the cities of Pittsburg and Antioch were reviewed to identify areas that would be inundated by a 100-year flood. A 100-year flood is a flooding event that has a probability of occurring once in 100 years. The FIRM maps indicate that SR 4 is within a 100-year flood zone at the Loveridge Road Interchange. The 100-year flood zone in this area encompasses portions of SR 4 between West Kirker Creek and East Kirker Creek. There is also a narrow strip of 100-year flood zone on SR 4 at the immediate location of the Los Medanos Wasteway, Markely Creek, West Antioch creek (centering predominately on the southeast quadrant of the SR 4 / Contra Loma–L Street Interchange) and East Antioch Creek (see Figure 2.2.1-1.). These areas are designated as flood plain (not floodways) and are shown in detail in the Hydrology Report.

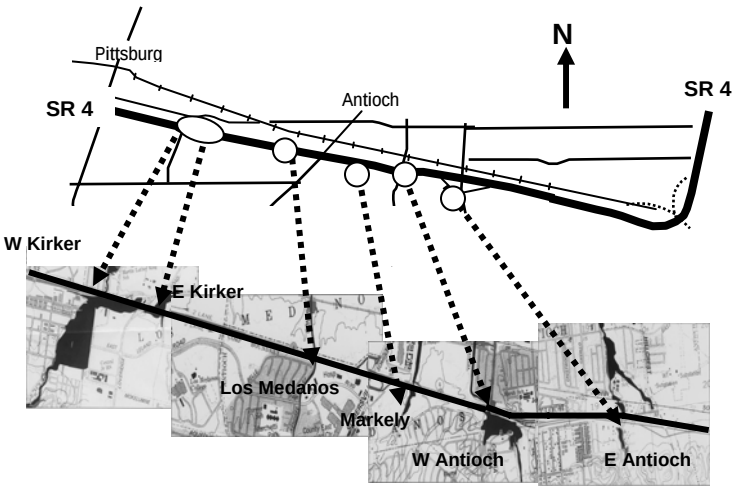


Figure 2.2.1-1: 100-Year Flood Zone in Project Area

Existing Drainage Conditions

The Hydrology Study reports that drainage at the Loveridge Road Interchange has been a long-standing issue. SR 4 is lower in elevation at the interchange than in the surrounding area, and it requires pumping to discharge runoff that drains to the low point at the interchange. The pumped water ultimately discharges into West Kirker Creek. West Kirker Creek is undersized for the runoff that drains to it each winter. As more upstream development has occurred in the watershed, West Kirker Creek has flooded more regularly, forcing flood waters to back up into the depressed Loveridge Road Interchange. Pumps cannot handle the flow during heavy storms until the outfall creek level returns to a normal level. The existing flooding conditions at West Kirker Creek have been documented in numerous previous studies, which are referenced in the Hydrology Report.

The City of Pittsburg is currently improving West Kirker Creek downstream of SR 4, and improvements are scheduled to be completed in December 2004. East Kirker Creek, which is located approximately 250 meters (820 feet) east of the interchange and flows into West Kirker Creek north of the proposed project, is not part of the City's current improvement program, although planning studies are under way. East Kirker Creek currently presents limiting factors for the drainage of SR 4. A 1999 study conducted by Camp Dresser & McKee indicated that downstream restrictions in East Kirker Creek north of SR 4 exist; the greatest limitation identified constricts the flow to 11.0 cubic meters per second (m3/s), or 390 cubic feet per second (cfs). Even upgraded culverts at SR 4 would back up with flooded water from this downstream constraint. In the past, East Kirker Creek had flooded during major storms. The City of Pittsburg is currently evaluating alternatives to address the downstream constraints in East Kirker Creek north of the Loveridge Road interchange.

To the east is the City of Antioch, where the watershed flows in a south to north direction with SR 4 constructed at the natural boundary between the flat land and the hills which rise to the south. Here, SR 4 sits significantly higher than the surrounding property and drainage. The west Antioch Creek

watershed has recently experienced substantial growth, resulting in increased storm water runoff and culminating in a recent expansion of the existing West Antioch Creek culvert crossing of SR 4. These culverts have been capped until downstream drainage improvements are completed by the City of Antioch (in order to mitigate potential flood damage downstream).

Culvert Capacity

Storm runoff was estimated using the Contra Costa County Flood Control District's computerized HYDRO 6 Rainfall/Runoff Program. *The methodology used for determining the appropriate design storm for cross culverts was consistent with criteria from Chapter 800 of Caltrans Highway Design Manual. Peak 25-year, 50-year, and 100-year culvert capacity values were calculated for comparison purposes. A risk assessment using all three of these return periods would be performed during the design phase for all major cross culverts to identify potential flood impacts prior to selecting a culvert size. All major cross culverts would be able to pass a 25-year storm as a minimum.*

Both existing and future (year 2020) storm runoff were calculated. Future storm runoff was determined based on the City of Pittsburg's General Plan with future estimates of land uses. The existing culverts were deemed deficient when the calculated storm runoff exceeded the full culvert capacity. Deficiencies were identified at East Kirker Creek east of Loveridge Road under both existing and future conditions, however, these deficiencies were due to downstream constrictions. No deficiencies were identified for Markely Creek, Los Medanos Wasteway, or West Antioch Creek. Deficiencies were identified at East Antioch Creek and some minor watersheds located immediately to the west.

2.2.1.3 Impacts (Including Permanent, Temporary, Direct and Indirect Impacts)

The project is located in a 100-year flood hazard area. Regulations governing the National Flood Insurance Program (23 CFR 650, Subpart A Section 650) were used, in part, as guidance for the evaluation of floodway impacts. A Floodplain Evaluation is required of FHWA projects as described under this regulation and as required by Caltrans for project work on bridges over waterways. Section 650.111 of the regulations calls for location hydraulic studies to be performed with detailed engineering design drawings, and lists five location considerations to be examined for floodplain encroachments (which coincide with the policies of FHWA):

1. Risks associated with implementation of the action.
2. Impacts on the natural and beneficial floodplain values.
3. Avoid support of incompatible floodplain development.
4. Measures to minimize impacts associated with the action.
5. Measures to restore and preserve the natural and beneficial floodplain values affected by the action.

Risks associated with implementation of the action: Risks associated with this site include the known limitations in downstream capacity of East Kirker Creek east of Loveridge Road. The Hydrology Study determined that downstream limitations would still result in back-up of flood waters south of SR 4 east of the Loveridge Interchange. Any increase in culvert capacity within the project limits must not be connected to existing downstream conveyance facilities until the downstream facilities have been upsized for future conditions. Otherwise, increased downstream flooding may result.

Impacts on natural and beneficial floodplain values: The project area is urbanized and offers little natural and beneficial floodplain value. The current downward slope in the project area is from south to north. This would not change as a result of the project. Water is currently transported from the project site by the existing drainage systems. This will also occur after construction of the project.

Avoid support of probable floodplain development: The project vicinity is already heavily urbanized and is planned for full build-out in commercial uses by both the City of Pittsburg and City of Antioch General Plans. The reconstructed interchange will facilitate travel through the floodplain area, but is unlikely to induce new development in the floodplain.

Measures to minimize floodplain impacts associated with the action: The project includes an upgrade of the existing pump station at the Loveridge Road Interchange to provide SR 4 protection for a 50-year storm. Caltrans is actively coordinating with the City of Pittsburg to address the downstream flooding issue as a separate project. Improvement of the existing outfall for this drainage system and more aggressive clean-out of the box culverts and pipes downstream of SR 4 are being considered. These improvements, if warranted, would then be connected to any downstream improvements proposed by the City of Pittsburg. After an analysis of the East Kirker Creek cross culvert is completed, supplemental hydraulic capacity will be provided if necessary.

Measures to restore and preserve the natural and beneficial floodplain values impacted by the action: Water is currently transported from the project site by the existing drainage systems. This will also occur after construction of the project. The new culverts and upgraded pump station will enhance the transport of storm water away from the project area.

It is also the policy of FHWA to avoid significant encroachments and longitudinal encroachments in the floodplain where practicable. Figure 2.2.1-1 shows locations where cross-culverts will be lengthened and/or enlarged. There will be no longitudinal encroachment of the floodplain.

Work within the project area should result in no significant floodplain impacts. Hydraulic modeling will be required during final design at each cross-culvert to show water surface elevations for pre-project and post-project conditions. A hydraulic report summarizing the results will be submitted for review by the local agencies listed in the FIRM Maps. If no significant impact is shown, a letter of "No-Rise Certification" may be accepted in lieu of the preparation of a "Conditional Letter of Map Revision" for FEMA.

2.2.1.4 Avoidance, Minimization and Compensation Measures

The project includes an upgrade to the existing pump station at the Loveridge Road Interchange. The long-standing flooding issue at the Loveridge Road Interchange, which has resulted from development upstream, is being addressed separately by the City of Pittsburg, in coordination with Caltrans. Caltrans and CCTA will continue to coordinate with the City to resolve this flooding issue. The proposed improvements should have no negative impact to the existing floodplain.

To the east, in the City of Antioch, East Antioch Creek and the minor watersheds located immediately west have displayed deficient culvert capacities. Since this area is located above grade, future culvert construction can be accomplished through jacking. Since downstream conveyance must also be improved before such cross culvert capacities are increased, the jacking of supplemental culverts will occur at a future date. This will avoid excess conveyance to the downstream system which will also avoid increased flooding impacts.

Water quality will be improved through a proposed storm water management plan for SR 4 to be implemented as part of this project and discussed in Section 2.2.2.

2.2.2 Water Quality and Storm Water Runoff

A Storm Water Data Report (Parsons, June 2004) was prepared for the project in accordance with Caltrans requirements. As with many storm drainage systems throughout California, the SR 4 drainage system was originally designed with the objective of conveying storm water runoff off the site to streams and flood control channels as quickly as possible. The proposed design (as described in the Storm Water Data Report) integrates this conventional flood control methodology with a system for storm water quality control that protects the off-site drainages/streams from non-point source pollution generated from the freeway. Potential pollutants found on streets and freeways include heavy metals, organic compounds (including petroleum hydrocarbons), sediments, trash, debris, oil, and grease. Concentrations of such pollutants are generally highest during the “first flush” of an initial rain storm, after which concentration levels decrease rapidly.

Best Management Practices (BMPs) that remove such pollutants are being proposed for incorporation into the SR 4 drainage system. In general, the on-site storm drain system will include structural treatment BMPs such as vegetated swales or detention basins. These BMPs would allow for a significant reduction, compared with current conditions, in trash, debris, absorbed hydrocarbons and metals in freeway runoff entering the streams and channels that cross the freeway. These streams and channels include Kirker Creek (East and West), Markely Creek, Antioch Creek (East and West), and the Los Medanos Wasteway. The following sections summarize the findings of the Storm Water Data Report.

2.2.2.1 Regulatory Setting

The SR 4 (East) Widening project is located within the jurisdictions of two Regional Water Quality Control Board agencies (the San Francisco Bay Region and the Central Valley Region). The western portion of the project area lies in the City of Pittsburg, within the San Francisco Bay Regional Water

Quality Control Board's Suisun Basin Hydrologic Planning Area. Regulations for discharges within this area are included in the Water Quality Control Plan for the San Francisco Bay Basin (June, 1995).

The eastern portion of the project lies in the City of Antioch, within the Central Valley Regional Water Quality Control Board's Hydrologic Unit 544 (Sacramento-San Joaquin Delta). Regulations for discharges within this area are included in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (September, 1998).

The State Water Resources Control Board has also instituted a Water Quality Control Plan for the San Francisco Bay/San Joaquin Delta Estuary (May 1995) which encompasses the entire project area.

2.2.2.2 Affected Environment

The beneficial uses for the hydrologic areas as described within the various Basin Plans include groundwater (referring to the Pittsburg Plain), which has potential use for municipal and domestic, agricultural, industrial service and industrial process supply. Municipal and domestic water is supplied by the Contra Costa Water District through the treatment of raw water in the Contra Costa Canal. The Contra Costa Canal is fed by waters located upstream of the project site. No specific beneficial use has been listed in any of the Basin Plans for East or West Kirker Creek, Markely Creek, East or West Antioch Creek, or the Los Medanos Wasteway.

2.2.2.3 Impacts

The project would result in a minor increase in impervious surface in the project area. This can be expected to translate into minor localized increases in urban runoff, as described in the Storm Water Data Report (Parsons, June 2004). Due to the lag time between the peak runoff from major tributaries and that from the freeway runoff, the peak flow from the freeway will have substantially subsided by the time the watershed peak occurs. This subsidence, coupled with the very minor increase in impervious surface, results in an insignificant increase in peak flow in the overall watershed due to this project.

As described previously, runoff from highways has been found to contain numerous pollutants, including metals, hydrocarbons, solids, oil and grease. The incorporation of the permanent best management practices into the freeway's drainage system will result in an improvement in water quality from the freeway runoff as it enters into the adjacent surface waters. This storm water is ultimately conveyed to the Sacramento River.

2.2.2.4 Avoidance, Minimization, and Compensation Measures

As described in the Caltrans Storm Water Management Plan (SWMP), BMPs are designed and implemented to reduce the discharge of pollutants from the Caltrans storm drain system to the maximum extent practicable. Due to site constraints within the narrow project corridor, the on-site drainage system will be designed with a BMP concept in place that maximizes pollutant removal while taking into account economic constraints related to maintenance, right-of-way, and construction costs. Permanent treatment BMPs evaluated for the SR 4 project include extended detention basins

and biofiltration swales. Wetlands and retention basins were deemed inappropriate due to vector control issues. Infiltration basins and infiltration trenches were deemed inappropriate so as not to affect potential beneficial uses of the underlying groundwater table.

Erosion control measures would be used to address site soil stabilization and reduce deposition of sediments in the adjacent surface waters. Typical measures include the application of soil stabilizers such as hydroseeding, netting, erosion control mats, rock slope protection and others. During construction other erosion control procedures will be used such as the use of mulch on all disturbed areas, the use of fiber rolls along slopes, the use of silt fences at the boundaries of the construction site, stabilized construction entrances and exits equipped with tire washing capability, and check dams placed strategically to reduce flow velocity and to filter flows in defined drainage-ways.

2.2.3 Geology and Soils

Based on the *Preliminary Geotechnical Report* (Parikh Consultants, Inc., September 2003), the proposed project is not expected to have substantial impacts from a geotechnical standpoint. Potential impacts can be fully addressed using Caltrans standard design and construction techniques. The following sections summarize the findings of the Geotechnical Report.

2.2.3.1 Affected Environment

The proposed project is located at the northern edge of the Diablo Range and at the southeast end of Suisun Bay, where it meets the Sacramento-San Joaquin Delta. SR 4 crosses streams that drain the Mount Diablo uplands to the south. The geologic deposits that underlie SR 4 are primarily Pleistocene alluvial terrace deposits. Younger Holocene alluvial sediments underlie the roadway where it crosses active stream channels. Close to the project site lie Pliocene non-marine sediments of the Tehama Formation.

A review of numerous soil borings indicates that existing surface soils are characterized by either embankment fill or native soil. The embankment fill is compacted loose to medium-dense silt / silty clay. Native soils in the upper 6 to 15 meters (20 to 25 feet) are primarily loose to medium-density silt, sandy silt, clayey sand, and silty sand with interbeds of stiff to very stiff silty clay, sandy clay, and clayey silt. Dense to very dense silty sand and sandy silt generally underlie these upper layers.

Groundwater was encountered in many of the soil borings. The shallowest groundwater is located at Victory Highway Separation (SR 4 / SR 160 interchange) at 5 meters (16 feet) below ground surface, and the deepest is at Newlove Overhead, which is 1.5 kilometers (0.9 miles) southeast of the eastern SR 4 project limit, at approximately 14 meters (45 feet) below ground surface. The groundwater level is expected to fluctuate due to seasonal groundwater conditions, surface and subsurface flows, ground surface run-off, and other factors.

The project is located within a seismically active portion of Northern California. Many faults in the San Francisco Bay Area are capable of producing earthquakes and strong ground shaking at the site. Based on the earthquake probabilistic study conducted by the United States Geological Survey (USGS) in 1999, the probability of one or more large earthquakes in the Bay Area in the next 30 years is estimated at 70%.

Table 2.2.3-1 presents the Maximum Credible Earthquake (MCE) for each active fault system located within relatively close proximity of the project site. MCE magnitudes represent the greatest magnitude earthquake that could occur on a given fault based on current understanding of the regional tectonic structure.

The northwest trending Antioch Fault and the Coast Ranges-Sierran Block Boundary Zone pass through or near the project roadway alignment. The Geotechnical Report identified the Coast Ranges-Sierran Block Boundary Zone as the controlling fault for the project site.

Table 2.2.3-1: Maximum Credible Earthquake Values

Fault and Fault Type	Estimated Closest Distance to Fault from Project Area	Maximum Credible Earthquake
Antioch (strike-slip)	0 Km (0 miles)	6.75
Coast Ranges-Sierran Block Boundary Zone (reverse)	0 Km (0 miles)	7.00
Vaca-Kirby Hill-Montezuma Hills/East (unknown)	8.5 Km (5.3 miles)	6.75
Concord (strike-slip)	14.0 Km (8.7 miles)	6.50
Greenville (strike-slip)	7.5 Km (4.7 miles)	7.25
Calaveras-Pacines-San Benito (strike-slip)	23.5 Km (14.6 miles)	7.50
Hayward (strike-slip)	36 Km (22.4 miles)	7.50
San Andreas/North (strike-slip)	66 Km (41.0 miles)	8.0

2.2.3.2 Impacts

Soil Corrosivity

Soils at the site have a moderate corrosive potential that should be considered in the selection and design of foundation systems of structures. In addition, materials used in culvert placement should be considered to avoid adverse corrosive effects.

Soft Ground Conditions

Because soft clay may exist as underlying material in the study area, pavement and shoulder, retaining wall, and sound wall construction design considerations may be affected. A waiting period could be required to accommodate settlement of construction embankments. Site-specific studies may be required to evaluate settlement criteria.

Shrink-Swell Potential

Clay and clay loam soil units in the project vicinity appear to have high shrink-swell potential. Site-specific studies may be required to evaluate pavement subgrade conditions.

Slope Stability

Embankments subject to weather would have the potential to be affected by erosion forces.

Seismic Considerations

Potential seismic hazards may arise from three sources: surface fault rupture, ground shaking, and liquefaction. The potential for fault rupture along the project site is relatively moderate to high. Based on available data, the possibility of strong ground shaking near the site is also considered moderate to high. Given the soil types identified in the geotechnical survey, the liquefaction potential at the site is considered to be relatively low.[1] Nevertheless, because of the limited nature of past liquefaction studies, detailed investigation is required in this regard during the design phase of the project.

Paleontology

The project area does not extend into exposed bedrock units. Rather, all grading from the project is expected to expose relatively young alluvial deposits composed of materials eroded from the Pliocene age bedrock units which outcrop in the hills south of the project area. Those bedrock units may contain some freshwater mullosk shells and/or mammal bones. However, any fossils eroded from the bedrock units which have been transported to and deposited in the alluvial fans in the project area are likely to be very degraded and are not expected to have any paleontological significance.

2.2.3.3 Avoidance, Minimization, and Compensation Measures

Seismic Considerations

Site-specific seismic analysis would be performed for individual structures where improvements are proposed. The project will conform to current seismic design standards specified to withstand the seismic effects that would result from a maximum credible earthquake.

Soil Corrosivity

Soil corrosivity will be carefully examined during the final design phase of this project. The final design and materials selection of foundation systems will consider the potential effect of soil corrosivity. Potential for corrosion of culverts will be evaluated, and materials will be selected accordingly.

[1] Liquefaction occurs when saturated soils lose their strength and stiffness. During an earthquake, shaking can increase the pressure of the water surrounding the soil particles. Liquefaction occurs because the increased water pressure within the saturated soils causes the soil particles to move with respect to one another.

Soft Ground Conditions

Site-specific studies will be conducted as necessary to determine settlement requirements. Embankment fill materials will be selected and placed in accordance with the Caltrans Highway Design Manual. Final design elements will include any necessary "waiting period" requirements for embankment settlement. In instances where retaining walls of greater than 3 meters (9.8 feet) in height are required or where soft ground conditions exist, special foundations will be implemented. Soft ground stabilization techniques will be specified where soft clayey material is encountered.

Shrink-Swell Potential

Site-specific studies will be conducted to determine treatment requirements for pavement subgrade. Measures such as ground improvement/modification with lime treatment or over-excavation and replacement with appropriate soils will be evaluated and applied as needed.

Slope Stability

Proper drainage and Caltrans standard grading and erosion control measures will be implemented to address slope stability. Construction of sediment ponds or siltation basins may be considered to retain excess runoff during periods of heavy rainfall.

These design and construction techniques will fully address potential impacts of seismic and soil conditions in the project vicinity, and no mitigation measures are warranted.

2.2.4 Hazardous Waste/Materials

This section is based upon the *Initial Environmental Site Assessment* prepared by Parikh Consultants (March 2002) for the project. The assessment was conducted to identify and evaluate potential hazardous waste/materials sites and environmental factors that may have affected soil and groundwater quality in the proposed project right-of-way and construction area due to past and present environmental and commercial activities.

2.2.4.1 Review of Hazardous Waste Site Databases

The investigation included a survey of previous land uses in and around the proposed right-of-way, a field inspection of the project area, a review of area geology and hydrogeology, and a database review of listings of federal, state, and regional regulatory agencies responsible for recording incidents of spills, soil and ground water contamination, and transfer, storage, or disposal facilities that handle hazardous materials.

The database record search of regulatory agency lists was conducted by VISTA Environmental Information, Inc. to identify the presence of hazardous waste/materials sites within a two-kilometer (1.2-mile) perimeter of the proposed project area. The records listed in Table 2.2.4-1 were searched for the existence of sites within the proposed project area.

Table 2.2.4-1: Database Records Searched for Existence of Hazardous Waste/Materials in SR 4 Project Vicinity

Agency	Database	Type of Records
Databases Searched to 2 Kilometers (1.2 Miles)		
U.S. EPA	NPL	National Priority List
U.S. EPA	CORRACTS	Resource Conservation and Recovery Act (RCRA) Corrective Actions
State	SPL	State equivalent priority list
Databases Searched to 800 Meters (0.5-Mile)		
U.S EPA	RCRA-TSD	RCRA permitted treatment, storage, and disposal facilities
U.S. EPA	CERCLIS/NFRAP	Sites under review by U.S. EPA (Comprehensive Environmental Response, Compensation and Liability Information System/No Further Remedial Action Planned)
State	SCL	State equivalent CERCLIS list
State/Regional/County	LUST	Leaking underground storage tanks
State/Regional/County	SWLF	Solid waste landfills, incinerators, or transfer stations
State	DEED RSTR	Sites with deed restrictions
Regional	NORTH BAY	Sites on North Bay Toxics List
Regional	SOUTH BAY	Sites on South Bay Toxics List
State	CORTESE	State index of properties with hazardous waste
State	TOXIC PITS	Toxic pits cleanup facilities
U.S. EPA	FINDS	Facility Index System
USGS/State	WATER WELLS	Federal and State drinking water sources
U.S. EPA	TRIS	Toxic Release Inventory Database
Databases Searched to 400 Meters (0.2-Mile)		
State/County	UST	Registered underground storage tanks
State	AST	Registered aboveground storage tanks
Databases Searched to 200 Meters (0.1-Mile)		
U.S. EPA	GNRTR	RCRA registered small or large generators of hazardous waste
U.S. EPA	RCRA Viol	RCRA violations/enforcement actions
U.S. EPA	ERNS	Emergency Response Notification System of Spills
State	SPILLS	State spills list

Source: Parikh Consultants, Inc., Initial Environmental Site Assessment, Route 4 East Corridor Widening, Pittsburg, Contra Costa County, California, March 2002.

Information for each of the sites listed in the VISTA report was reviewed to determine the distance from the proposed project right-of-way and to ascertain the potential for the listed site to affect the proposed project. Criteria used in making this determination included the type of site, whether the site is hydrologically upgradient or downgradient from the right-of-way, the nature of the contamination, and the distance of the site from the proposed project right-of-way. These criteria were used in combination to evaluate each site.

A site reconnaissance of the proposed project was conducted to identify possible nearby land uses that might adversely affect the corridor due to environmental hazards and to observe problem sites or contamination that was visually evident.

2.2.4.2 Affected Environment

SR 4 from Loveridge Road to the eastern project limit is a four-lane freeway. The sides of the highway are covered by vegetation. A mixture of vacant land, residential uses, and commercial and light industrial businesses occupies the north and south sides of the proposed project area. The majority of the properties to the immediate north are either vacant land or residential or light commercial properties. To the immediate south is mostly vacant land or residential properties. Along the interchanges to the south of the proposed project area are a few gasoline service stations, a used auto dealership, and a number of commercial storage facilities.

The proposed project area is an important traffic artery for northern and eastern Contra Costa County. Review of previous land use and the site reconnaissance indicate that the corridor has supported vehicular activity since the 1950s. Therefore, surface soils along SR 4 have the potential to be contaminated with aerially deposited lead (ADL) from the exhaust of cars burning leaded gasoline. Additionally, structures in the proposed project area, such as overcrossings or on- and off-ramps, may have been constructed with asbestos-containing materials.

Based on a review of available reports from sites near the project area, depth to groundwater within the project area varies from five to 25 meters.

Under existing conditions, hazardous waste/materials may be transported on the existing railroad line or public roadways in the project area.

In general, most leaking underground storage tank (LUST) sites reported have a plume that extends less than 50 meters (164 feet) downgradient so reviewing records for upgradient sites for a distance of 200 meters (0.1 mile) from the project right-of-way likely includes all sites with any potential to affect the project. Most of the sites with potential for hazardous waste/materials in the SR 4 corridor were either hydrologically downgradient or too far upgradient from the proposed project right-of-way to have an effect.

The database review revealed three existing hazardous waste/materials sites that have potential to affect the proposed project area.

There are three UST sites identified within 50 meters (164 feet) of the proposed project area; two are also identified as LUST sites, both in Antioch:

- Exxon S/S 7-3615 located at 2610 Contra Loma Boulevard. This site is now occupied by an Arco service station (Bhalla's Gas & Auto Service). This site is adjacent to the proposed project area and is hydrologically upgradient to it. Remediation is underway for gasoline and methyl tertiary butyl ether (MTBE) contamination of the soil and groundwater. During the site visit, a remediation system and groundwater monitoring wells were observed. The two wells to the north of this site adjacent to the proposed project right-of-way act as sentry wells. The remediation appears to be effective and the site will undergo closure activities in the near future.
- Unocal #5963, located at 2701 Contra Loma Boulevard. This site is located 150 meters (492 feet) to the south of the project right-of-way and is hydrologically upgradient. MTBE was detected in the groundwater as recently as 2001. A groundwater remediation system is on site; groundwater monitoring wells were not observed off site.

The third site – an active service station adjacent to the proposed project area – is Hillcrest Shell Service, located at 1801 Hillcrest Avenue in Antioch. This site is 50 meters (164 feet) south and upgradient of the proposed project area and contains one diesel and five gasoline USTs. During the site visit, no evidence of groundwater monitoring wells was observed off-site.

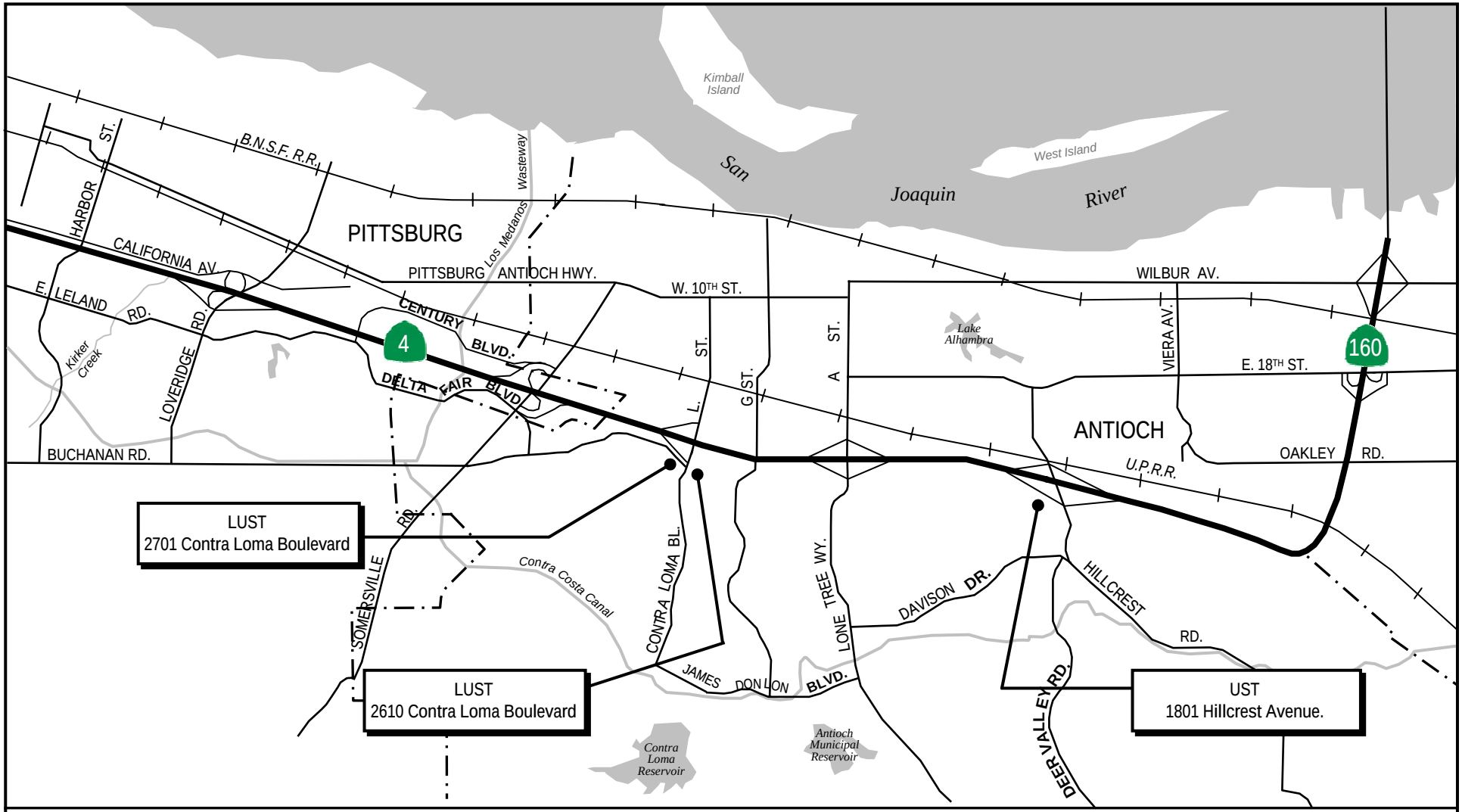
Figure 2.2.4-1 illustrates the location of the three hazardous waste/materials sites.

2.2.4.3 Impacts

The two active LUST sites, both in Antioch, would be unlikely to have an adverse impact on the proposed project area, as both are currently under remediation, with one nearing readiness for closure activities. The UST site in Antioch has the potential to have an adverse impact.

Surface soils along SR 4 would have the potential to be contaminated with ADL from the exhaust of cars burning leaded gasoline. In addition, structures in the proposed project area, such as overcrossings or on- and off-ramps, may have been constructed with asbestos-containing materials and have the potential to affect workers during construction.

The project would not involve new routine transport, use, storage, or disposal of hazardous waste/materials, and it would not result in any change to existing routine transport, use, storage, or disposal of such materials along the corridor.



Legend:

UST = Underground storage tank **LUST = Leaking underground storage tank** **● = Location of potential site**

N

NOT TO SCALE

Figure 2.2.4-1

STATE ROUTE 4 (EAST) WIDENING PROJECT: LOVERIDGE ROAD TO STATE ROUTE 160

04-CC-4-KP 37.9/R46.3 (PM 23.5/R28.8)

LOCATIONS OF POTENTIAL HAZARDOUS WASTE/MATERIALS SITES

2.2.4.4 Avoidance, Minimization and Compensation Measures

It is recommended that surface samples of soil be collected and analyzed for total lead. Any sample exceeding 1,000 milligrams/kilogram (mg/kg) should also be tested for Toxicity Characteristic Leaching Procedure (TCLP). Any soil containing 5 milligrams per liter (mg/l) or more of lead is considered a RCRA hazardous waste for disposal purposes. If Caltrans was to use the affected soils on site, special provisions subject to the ADL variance provided to Caltrans by the Department of Toxic Substances Control (DTSC) should be used. This variance includes testing of the soils exceeding the hazardous waste thresholds via a WET-DI procedure, a waste extraction procedure using de-ionized water as a leaching agent. If an entity other than Caltrans were to be responsible for construction of the proposed project, that entity would consult with DTSC and the San Francisco Regional Water Quality Control Board (RWQCB) regarding the applicability of the variance and management of lead-impacted soil. A detailed work plan and a sampling and testing program would be prepared in accordance with Caltrans guidelines during the design phase of the project.

Prior to any demolition work or upgrading or reconstruction of existing overpasses, on- or off-ramps, an asbestos-containing materials (ACM) survey would be conducted for these structures. In addition, any other structure (e.g., retaining or sound walls) requiring demolition would be tested for ACM prior to demolition. The ACM survey would be performed by an inspector who is Asbestos Hazardous Emergency Response Act (AHERA)-certified under Toxic Substances Control Act (TSCA) Title II and California Occupational Safety & Health Administration (Cal OSHA)-certified under Section 1529 of the California Code of Regulations. Prior to demolition, a notification along with the results of the ACM survey would be submitted to the Bay Area Air Quality Management District as a part of the permitting process.

Additional review would be performed during the final design phase of the project to ensure that the LUST sites located in Antioch at 2610 Contra Loma Boulevard (Exxon S/S 7-3615) and at 2701 Contra Loma Boulevard (Unocal #5963) would not have an adverse impact on the proposed project.

Since the Hillcrest Shell Service is only 50 meters (164 feet) upgradient of the proposed project area, additional file review would be conducted at the County Health Department and the RWQCB during the final design phase of the project to ensure there have not been recent releases to soil or groundwater by the USTs.

The selection of the foundation systems should take the depth to groundwater into consideration. If such excavations were to be designed below the groundwater, it would be addressed in a Phase II workplan during the design phase of the project and carried out in a testing program.

2.2.5 Air Quality

This section reports the results of the *Air Quality Impact Technical Report* (Terry A. Hayes Associates, 2004) prepared for the SR 4 (East) Widening Project.

2.2.5.1 Regulatory Setting

Air quality in the United States is governed by the federal Clean Air Act (CAA). In addition to being subject to the requirements of CAA, air quality in California is also governed by more stringent regulations under the California Clean Air Act (CCAA). At the federal level, the CAA is administered by the United States Environmental Protection Agency (USEPA). In California, the CCAA is administered by the California Air Resources Board (CARB) at the state level and by the Air Quality Management Districts at the regional and local levels. The proposed project is located within the Bay Area Air Quality Management District (BAAQMD).

USEPA is responsible for establishing the National Ambient Air Quality Standards (NAAQS), which are required under the 1977 CAA and subsequent amendments. USEPA regulates emission sources that are under the exclusive authority of the federal government and establishes various emission standards, including those for vehicles sold in states other than California. Automobiles sold in California must meet the stricter emission standards established by CARB.

CARB, which became part of the California Environmental Protection Agency (CalEPA) in 1991, is responsible for meeting the state requirements of the federal CAA, administering the CCAA, and establishing the California Ambient Air Quality Standards (CAAQS). The CCAA requires all air districts in the state to endeavor to achieve and maintain the CAAQS, which are generally more stringent than the corresponding federal standards.

BAAQMD is primarily responsible for assuring that the national and state ambient air quality standards are attained in the San Francisco Bay Area. BAAQMD has jurisdiction over an approximately 5,600-square-mile area, commonly referred to as the Bay Area Air Basin (BAAB). The District's boundary encompasses most of the nine Bay Area counties: Alameda County, Contra Costa County, Marin County, San Francisco County, San Mateo County, Santa Clara County, Napa County, southwestern Solano County and southern Sonoma County. The discussion of project air quality setting and effects refers primarily to conditions within the BAAB, which from both the federal and state regulatory perspectives is considered one geographic entity.

National and State Ambient Air Quality Standards

State and federal standards for major air pollutants are summarized in Table 2.2.5-1. Primary standards were established to protect the public health. Secondary standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation and other aspects of the general welfare. Since the CAAQS are more stringent than the NAAQS, the CAAQS are used as the standard in the air quality analysis for the SR 4 (East) Widening Project.

Table 2.2.5-1: State and National Ambient Air Quality Standards

Pollutant	Averaging Period	California		Federal	
		Standards	Attainment Status	Standards	Attainment Status
Ozone (O_3)	1 hour	0.09 ppm (180 µg/m^3)	Non-attainment	0.12 ppm (235 µg/m^3)	Non-attainment
	8 hour	--	--	0.08 ppm (157 µg/m^3)	Unclassified
Respirable Particulate Matter (PM_{10})	24 hour	50 µg/m^3	Non-attainment	150 µg/m^3	Unclassified
	Annual Arithmetic Mean	20 µg/m^3	Non-attainment	50 µg/m^3	Attainment
Fine Patriculate Matter ($PM_{2.5}$)*	24 hour	--	--	65 µg/m^3	Unclassified
	Annual Arithmetic	12 µg/m^3	Non-attainment	15 µg/m^3	Unclassified
Carbon Monoxide (CO)	8 hour	9.0 ppm (10 mg/m^3)	Attainment	9.0 ppm (10 mg/m^3)	Attainment
	1 hour	20 ppm (23 mg/m^3)	Attainment	35 ppm (40 mg/m^3)	Attainment
Nitrogen Dioxide (NO_2)	Annaul Arithmetic Mean	--	--	0.053 ppm (100 µg/m^3)	Attainment
	1 hour	0.25 ppm (470 µg/m^3)	Attainment	--	--
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	--	--	0.03 ppm (80 µg/m^3)	Attainment
	24 hour	0.04 ppm (105 µg/m^3)	Attainment	0.14 ppm (365 µg/m^3)	Attainment
	3 hour	--	--	--	--
	1 hour	0.25 ppm (655 µg/m^3)	Attainment	--	--

* The federal air quality standard for PM2.5 was adopted in 1997. Presently, no methodologies for determining impacts relating to PM2.5 have been developed or adopted by federal state, or regional agencies. Additionally, no strategies or mitigation programs for PM2.5 have been developed or adopted by federal, state, or regional agencies.

Source: California Air Resources Board, Federal and State Air Quality Standards (1/9/2003), Bay Area Air Quality Management District, 2003.

Attainment Status

Under CAA and CCAA requirements, areas are designated as either attainment or non-attainment for each criterion pollutant based on whether the NAAQS or CAAQS have been achieved. Areas are designated as non-attainment for a pollutant if air quality data show that a state or federal standard for the pollutant was violated at least once during the previous three calendar years. Exceedences that are affected by highly irregular or infrequent events are not considered violations of a state standard, and are not used as a basis for designating areas as non-attainment.

Carbon Monoxide (CO)

Carbon monoxide (CO), a colorless and odorless gas, interferes with the transfer of oxygen to the brain. It can cause dizziness and fatigue, and can impair central nervous system functions. CO is emitted almost exclusively from the incomplete combustion of fossil fuels. Automobile exhausts release most of the CO in urban areas. CO dissipates relatively quickly, so ambient carbon monoxide concentrations generally follow the spatial and temporal distributions of vehicular traffic. CO concentrations are influenced by local meteorological conditions, primarily wind speed, topography, and atmospheric stability. The BAAB is in attainment for CO at both the federal and state levels.

Ozone (O_3)

Ozone (O_3), a colorless toxic gas, is the chief component of urban smog. O_3 enters the blood stream and interferes with the transfer of oxygen, depriving sensitive tissues in the heart and brain of oxygen. O_3 also damages vegetation by inhibiting growth. O_3 forms in the atmosphere through a chemical reaction between reactive organic gases (ROG) and nitrogen oxides (NO_X) under sunlight. Motor vehicles are the major sources of ROG and NO_X. O_3 is present in relatively high concentrations within the Bay Area air basin. Under the CAA and the CCAA, the Contra Costa County portion of BAAB is designated as a non-attainment area for O_3.

Nitrogen Dioxide (NO_2)

Nitrogen dioxide (NO_2), a brownish gas, irritates the lungs. It can cause breathing difficulties at high concentrations. Like O_3, NO_2 is not directly emitted, but is formed through a reaction between nitric oxide (NO) and atmospheric oxygen. NO and NO_2 are collectively referred to as NOx and are major contributors to ozone formation. NO_2 also contributes to the formation of PM_{10} (see discussion of PM_{10} below). The BAAB is in attainment for NO_2.

Sulfur Dioxide (SO_2)

Sulfur dioxide (SO_2) is a product of high-sulfur fuel combustion. The main sources of SO_2 are coal and oil used in power stations, in industries, and for domestic heating. Industrial chemical manufacturing is another source of SO_2. SO_2 is an irritant gas that attacks the throat and lungs. SO_2 concentrations have been reduced to levels well below the state and national standards, but further reductions in emissions are needed to attain compliance with standards for sulfates and PM_{10}, of which SO_2 is a contributor. The BAAB is in attainment for SO_2 at both the federal and state levels.

Suspended Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter consists of very small liquid and solid particles floating in the air, which can include smoke, soot, dust, salts, acids, and metals. Respirable particulate matter (PM_{10}) refers to particulate matter less than 10 microns in diameter, about one/seventh the thickness of a human hair. Fine particulate matter ($PM_{2.5}$) refers to particulate matter that is 2.5 microns or less in diameter, roughly 1/28th the diameter of a human hair. PM_{10} and $PM_{2.5}$ pose a greater health risk than larger-size particles. When inhaled, these tiny particles can penetrate the human respiratory system's natural defenses and damage the respiratory tract. Major sources of PM_{10} include motor vehicles; wood

burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning, industrial sources, windblown dust from open lands; and atmospheric chemical and photochemical reactions. $PM_{2.5}$ results from fuel combustion (from motor vehicles, power generation, industrial facilities), residential fireplaces, and wood stoves. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as SO_2, NO_X, and volatile organic compounds. The Contra Costa portion of the BAAB is a non-attainment area for PM_{10} under the CCAA.

Lead

Prior to 1978, mobile emissions were the primary source of lead in air. Between 1978 and 1987, the phase-out of leaded gasoline reduced the overall inventory of airborne lead by nearly 95 percent. Currently, industrial sources are the primary source of airborne lead. Since the proposed project does not contain an industrial component, lead emissions were not analyzed in the air quality assessment. The potential for aerially deposited lead to be in soils along SR 4 is discussed in Section 2.2.4, Hazardous Wastes/Materials.

Air Quality Plans

The BAAQMD, in coordination with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG), is responsible for preparing air quality plans pursuant to the CAA and CCAA. Under the CAA, State Implementation Plans (SIPs) are required for areas that are designated as non-attainment for O_3, CO, NO_X, SO_X, or PM_{10}. For the Bay Area Air Basin, a SIP is required for O_3 since the region is currently designated as a federal non-attainment area for O_3. The most current SIP is called the Bay Area 2001 Ozone Attainment Plan, which was adopted by the MTC, ABAG, and BAAQMD in October 2001. CARB adopted this Plan in November 2001, and EPA approved the associated emissions budget in February 2002.

Whereas the SIP is prepared pursuant to the CAA, the Bay Area Clean Air Plan (CAP) is prepared to meet the requirements of the CCAA. The CAP is the region's plan for reducing ground-level ozone. The CAP identifies how the Bay Area Air Basin would meet the state O_3 standard by its attainment date. The 2000 CAP focuses on identifying and implementing control measures that would reduce O_3. It was adopted by the BAAQMD in December 2000.

Air Quality Conformity

Under the 1990 CAA Amendments, the U.S. Department of Transportation cannot fund, authorize, or approve federal actions to support programs or projects which are not first found to conform to CAA requirements. Transportation conformity is a way to ensure that federal funding and approval goes to those transportation activities that are consistent with air quality goals. A conformity determination demonstrates that total emissions projected for a plan or program are within the emissions limits ("budgets") established by the air quality plan or State Implementation Plan (SIP) and that transportation control measures (TCMs) are implemented in a timely fashion. Conformity applies to transportation plans, transportation improvement programs (TIPs), and projects funded or approved by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) in non-attainment or maintenance areas. Section 176 of the CAA specifies that no federal agency may

approve, support, or fund an activity that does not conform to the applicable implementation plan. FHWA and FTA jointly make conformity determinations within air quality non-attainment and maintenance areas to ensure that federal actions conform to the "purpose" of SIPs. In late 1993, USEPA promulgated final rules for determining conformity of transportation plans, programs, and projects. These final rules, contained in 40 CFR Part 93, govern the conformity assessment for the proposed project.

2.2.5.2 Affected Environment

The climatic conditions influencing air quality in the BAAB are coastal, with mild temperatures in the winter, the period of maximum rainfall, and moderate to warm temperatures during the dry summer. The SR 4 corridor climate is heavily influenced by conditions along the Carquinez Strait and Suisun Bay. Notable among these are strong westerly winds (from the Pacific Ocean to the Central Valley) during the summer and fall and easterly winds during the winter that are funneled through the strait. Vertical mixing of air currents at these times helps to disperse pollutants. Elevated pollutant levels can occur during the summer during periods of low wind speeds and shallow mixing.

Compared with other major urban areas in the state, the BAAB has relatively good air quality. Despite continuing, rapid growth, air quality has improved overall during the past couple of decades.

Air Monitoring Data

The BAAQMD monitors air quality conditions at various locations throughout the BAAB. The Pittsburg – 10th Street Monitoring Station, approximately 1.3 miles northwest of the project area, is the closest air monitoring station to the project vicinity. Historical data from the Pittsburg – 10th Street Monitoring Station was used to characterize existing conditions within the vicinity of the project area and to establish a baseline for estimating future conditions with and without the proposed project.

Criteria pollutants monitored at the Pittsburg – 10th Street Monitoring Station include O_3, CO, NO_2, SO_2, and PM_{10}. A summary of the data recorded at the monitoring station during the 2000-2002 period is shown in Table 2.2.5-2. The CAAQS and NAAQS for the criteria pollutants are also shown in the table. As Table 2.2.5-2 indicates, criteria pollutants CO, and NO_2 did not exceed the CAAQS between the years 2000 and 2002. O_3, SO_2, and PM_{10}, however, exceeded the state standard at least once between 2000 and 2002. None of the criteria pollutants exceed the NAAQS during the same three-year period.

Table 2.2.5-2: 2000-2002 Criteria Pollutant Violations: Pittsburg – 10th Street Monitoring Station

Pollutant	Standards	2000	2001	2002
Ozone (1-hour)	Maximum 1-hr Concentration (ppm) Days > 0.12 ppm (Federal 1-hr standard) Days > 0.09 ppm (State 1-hr standard)	0.107 0 1	0.118 0 2	0.111 0 4
Ozone (8-hour)	Maximum 8-hr Concentration (ppm) Days > 0.08 ppm (Federal 8-hr standard)	0.080 0	0.092 1	0.096 2
Carbon Monoxide	Maximum 8-hr concentration (ppm) Days > 9.5 ppm (Federal 8-hr. standard) Days > 9 ppm (State 8-hr standard)	2.68 0 0	2.68 0 0	2.51 0 0
Nitrogen Dioxide	Maximum 1-hr Concentration (ppm) Days > 0.09 ppm (State 1-hr standard)	0.054 0	0.062 0	0.054 0
Sulfur Dioxide	Maximum 24-hr Concentration (ppm) Days > 0.14 ppm (Federal 24-hr standard) Days > 0.05 ppm (State 24-hr standard)	0.009 0 0	0.012 0 0	0.016 0 0
PM_{10}	Maximum 24-hr concentration ($\mu g/m^3$) Calculated > 150 $\mu g/m^3$ (Federal 24-hr standard) Calculated > 50 $\mu g/m^3$ (State 24-hr standard)	55.5 0 1	97.7 0 3	73.2 0 2

Source: California Air Resources Board, October 2003.

2.2.5.3 Impacts

Methodology

The following calculation methods and estimation models were used to determine air quality impacts: South Coast Air Quality Management District's (SCAQMD) construction emissions calculation formulas, CARB's EMFAC2002 emissions factor model, and Caltrans' CALINE4 dispersion model.

The Caltrans' Transportation Project-Level Carbon Monoxide Protocol (1997) was used to determine CO impacts. CO concentrations at intersections were estimated by quantitative analysis because vehicular congestion is expected to continue at some roadway intersections after the project. The quantitative analysis was employed to ensure that there would be no CO violations as a result of slow moving or stopped traffic at these intersections. BAAQMD daily operational emissions thresholds are shown in Table 2.2.5-3. Federal operational emissions thresholds are shown in Table 2.2.5-4. CAAQs for CO at one- and eight-hour periods are 20 ppm and 9.0 ppm, respectively.

Table 2.2.5-3: BAAQMD Daily Operational Emissions Thresholds

Criteria Pollutant	Pounds Per Day
Carbon Monoxide (CO)	550
Reactive Organic Gas (ROG)	80
Nitrogen Oxides (NO_X)	80
Particulates (PM_{10})	80

Source: Bay Area Air Quality Management District.

Table 2.2.5-4: Federal Emissions Threshold for Nonattainment Areas

Pollutant	Pounds per Day /a/	Tons per Year
ROG	550	100
NO_X	550	100

/a/ Federal thresholds are expressed in tons per year. For ease of comparison, federal thresholds have been converted to pounds per day.

Source United States Code of Federal Regulations, Title 40, Part 93.

No-Build Alternative

The No-Build Alternative consists of planned and programmed improvements and continued routine maintenance of the roadway. The roadway improvements and maintenance are not anticipated to generate any new vehicle trips and, thus, would not affect the region's vehicle kilometers of travel (VKT) or vehicle miles of travel (VMT). Since regional VKT is not anticipated to increase, changes in vehicle emissions would be minimal. No impact is anticipated.

Build Alternative

The proposed project consists of widening State Route 4 from approximately 1.33 kilometers west of Loveridge Road Interchange to approximately 1.24 kilometers east of the Hillcrest Avenue Interchange. The road widening project would not generate any new vehicle trips, and thus, would not affect the region's VKT. Since regional VKT is not anticipated to increase, changes in vehicle emissions would be minimal. No impacts associated with operational emissions are anticipated for the Build Alternative.

Carbon Monoxide Concentrations

To provide a worst-case simulation of CO concentrations within the area that would be affected by the proposed project, CO concentrations at sidewalks adjacent to nine study intersections were analyzed. The "hotspot" study intersections were selected based on traffic volume and capacity (V/C ratio), as well as the traffic level of service (LOS). The analysis showed that none of the study intersections would exceed the state and federal one- and eight-hour CO standards. No impact related to CO concentrations would therefore occur under the Build Alternative.

PM_{10} Concentrations

The primary source of PM_{10} emissions for the SR 4 (East) Widening project would be existing road dust that is disturbed by the movement of the vehicles. The proposed project would not generate new vehicle trips; thus, PM_{10} concentrations would not increase and no impact is anticipated.

2.2.5.4 Avoidance, Minimization and Compensation Measures

No adverse impacts are anticipated, and therefore, no measures are recommended.

2.2.5.5 Transportation Conformity Analysis

FHWA cannot approve funding for project activities beyond preliminary engineering unless the project is in conformity with USEPA transportation conformity regulations (40 CFR Part 93). The criteria that the Build Alternative must satisfy are discussed below. The federal conformity criteria are applicable only to operations emissions. They do not apply to construction emissions.

§93.110 The conformity determination must be based on the latest planning assumptions.

ABAG and MTC are the Metropolitan Planning Organizations responsible for determining areawide population and employment forecasts, modeling regional travel demand, and formulating the Regional Transportation Plan (RTP) and the Transportation Improvement Program (TIP). Assumptions used in the transportation and traffic analysis for this project, upon which the microscale CO and regional criteria pollutant analyses are based, are derived from ABAG's most recently adopted population, employment, travel, and congestion estimates. Travel forecasts are based on ABAG's growth assumptions for Year 2025 and then increased by four percent to reflect overall growth in population and employment between 2025 and 2030.

§93.111 The conformity determination must be based on the latest emission estimation model available.

Emission estimates are based on CARB EMFAC 2002 model. Caltrans CALINE4 model was used for CO modeling. EMFAC2002 and CALINE4 models are the most recent models approved by USEPA.

§93.112 Conformity determination must be made according to the consultation procedures of this rule and in the applicable implementation plan, and according to the public involvement procedures established in compliance with 23 CFR Part 450. The conformity determination must be made according to §93.105(a)(2) and (e) and the requirements of 23 CFR Part 450.

The proposed project would follow the consultation procedures in 20 CFR Part 450, 40 CFR Part 51, and 40 CFR Part 93 (§93.105(a)(2) and (e)) before making its conformity determination. The environmental document for the proposed project would be available for public review and comment prior to adoption. FHWA was consulted during the preparation of the environmental document.

§93.114 There must be a currently conforming transportation plan and TIP at the time of project approval.

The conforming transportation plan is the 2005 RTP and the conforming TIP is the 2005 TIP. FHWA is expected to make its conformity determination for the 2005 RTP and TIP in August, 2005.

§93.115 The proposed project must come from a conforming transportation plan and TIP.

The State Route 4 (East) Widening Project is included in the financially constrained portion of the 2005 RTP and its associated TIP.

§93.116 The proposed project would not cause or contribute to any new localized CO or PM_{10} violations or increase the frequency or severity of any existing CO or PM_{10} violations in CO and PM_{10} non-attainment and maintenance areas.

Operations of the Build Alternative would not increase daily trips on State Route 4 or the regional vehicle miles traveled. The anticipated reduction in congestion on State Route 4 would improve traffic flow, incrementally reducing CO levels to below No-Build levels. No CO or PM_{10} violations would result from operations of the proposed project. The proposed project would not violate state or federal standards.

Based on the above, the proposed project satisfies USEPA's project-level conformity requirements (40 CFR Part 93).

2.2.6 Noise

This section describes the existing noise environment in the project area, anticipated noise effects of proposed project improvements, and recommended noise abatement measures. Noise impacts, including abatement, would be subject to reassessment during final design based upon further technical studies and public input. The type, location, and size of sound walls, if any, would be established with the participation of the affected residents and business owners.

2.2.6.1 Regulatory Setting

National Environmental Policy Act (NEPA)

Under NEPA, noise impacts and measures to mitigate adverse impacts must be identified, including the identification of impacts for which no or only partial mitigation is possible. The FHWA regulations described below constitute the Federal Noise Standard. Projects complying with this standard are also in compliance with the requirements stemming from NEPA.

California Environmental Quality Act (CEQA)

Under CEQA, a substantial noise increase may result in a significant adverse environmental effect and, if so, must be mitigated or identified as a noise impact for which it is likely that no, or only partial abatement measures are available. Specific economic, social, environmental, legal, and technological conditions may make additional noise attenuation measures infeasible.

State and Federal Guidelines for Noise Impact Evaluation

The noise impact evaluation criteria for the proposed project are in agreement with the Noise Abatement Criteria (NAC) established by the FHWA in *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (23 CFR Part 772, 2003) and criteria adopted by Caltrans in *Traffic Noise Analysis Protocol* (Protocol) (Caltrans, 1998a). For residential land uses, parks, schools, and hospitals, the FHWA outdoor noise criterion is 67 dBA and the interior noise criterion is 52 dBA.

According to the Protocol, traffic noise impacts occur when one or more of the following occurs: 1) the project results in a substantial noise increase; 2) predicted noise levels approach or exceed the NAC. A noise increase is considered by Caltrans to be substantial when the predicted noise levels with the project exceed existing noise levels by 12 dBA, Leq(h). A traffic noise impact will also occur when predicted noise levels with project approach within 1 dBA or exceed the Noise Abatement Criteria shown in Table 2.2.6-1. Noise abatement measures for this project are considered when predicted future peak hour traffic noise levels are equal to or exceed 66 dBA.

Table 2.2.6-1: Activity Categories and Noise Abatement Criteria

Activity Category	NAC, Hourly A-Weighted Noise Level, dBA Leq(h)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: 23 CFR Part 772, 2003

The Caltrans protocol states that if it is predicted that there would be traffic noise, all reasonable and feasible noise abatement measures must be identified and implemented. The abatement must provide a minimum of 5 dBA noise reduction to be considered feasible. Greater noise reductions are encouraged as long as they can be achieved under the reasonableness guidelines. The overall reasonableness of noise abatement is determined by considering a multitude of factors including but not necessarily limited to the following:

A. Cost of the abatement
B. Absolute noise levels
C. Change in noise levels
D. Noise abatement benefits
E. Date of development along the highway
F. Life cycle of abatement measures[2]
G. Environmental impacts of abatement construction
H. Views (opinions) of affected residents
I. Input from the public and local agencies
J. Social, economic, environmental, legal, and technological factors

Normally, noise abatement is not designed for the second-floor level. However, noise abatement designed to provide a 5 dBA noise reduction for the second-floor level without exceeding the modified allowance is considered within the scope of reasonableness. (Caltrans, 1998a)

[2] It is normally not considered reasonable to construct a wall where planned future use would limit its useful life to less than 15 years.

The Caltrans Traffic Noise Analysis Protocol for New Highway Construction and Highway Reconstruction Projects (Caltrans, 1998) identifies four scenarios under which noise impacts or abatement considerations for a project may need to be re-analyzed. These scenarios, quoted from Section 1.4.3 of the protocol, are as follows:

a) There has been a significant change in project design concept and /or scope from that of the most recent environmental analysis, or
b) A significant period of time has passed since the most recent environmental analysis, generally considered to be 3 years between project milestones, e.g. Record of Decision to Right-of-Way Certification, or
c) An undeveloped land becomes planned, designed and programmed, after the analysis, but before the date of public knowledge, or
d) An undeveloped land becomes developed after the date of public knowledge (disclosure of impacts, if any, but abatement not considered).

2.2.6.2 Affected Environment

Traffic Noise Measurement

Noise is unexpected or undesired sound. The primary sources of noise in the project area are traffic related. Traffic noise is mechanical energy generated by objects moving (or creating vibrations) along roadways and is transmitted by pressure waves through the atmosphere. A sound wave is defined by its frequency, or pitch, and its amplitude, or loudness. Frequency is expressed in terms of wave oscillations or cycles per second, referred to as Hertz. The human ear can detect sound in the range of 16 (low) to 20,000 (high) Hertz. Amplitude is the height of the sound wave and is measured in logarithmic units as the ratio of actual sound pressure relative to a reference pressure. The units of "loudness" are called decibels (dB).

Both amplitude and frequency have a substantial effect on human hearing and whether a sound is perceived as more intense than other sounds. In measuring sound, to account for the frequency response of the human ear, for instance, adjustments are applied at differing frequencies to reflect the average individual's sensitivity to sound. For noise associated with traffic and similar human activity, these adjustments are referred to as A-scale weighting. Noise levels are reported in terms of A-weighted decibels, or dBA.

Existing SR 4 Noise Levels

Existing noise levels in the vicinity of the project were determined through field measurements conducted in accordance with FHWA guidelines from September 25 through September 29, 2001, and September 8 through September 10, 2003. Primary sources of noise were existing traffic along SR 4 and local surface streets, with the dominant source being SR 4. Twenty-seven locations along the freeway were monitored for ambient noise levels, 19 locations for 20-minute durations and eight for 24-hour durations. Short-term measurements were adjusted to reflect peak-hour traffic-noise levels by comparison with long-term measurement results at nearby sites. At most monitoring locations along the project corridor, the measured hourly or adjusted hourly exterior dBA, Leq(h), already equals or exceeds the NAC. The adjusted short-term peak-hour traffic noise levels range between 63 and 76 dBA, while the measured long-term noise levels range between 62 and 74 dBA. Traffic noise levels are consistent during the daytime hours at all of the long-term measurement sites; there is no apparent peak hour for traffic noise.

The location of each noise monitoring site is shown on Figures A (Sheets 1 through 12) in Appendix A. Table 2.2.6-2 lists the noise monitoring sites and measured hourly Leq, dBA.

Table 2.2.6-2: Noise Measurement Locations and Results

Measurement Site No.	Address	Date	Start Time[1]	Duration	Measured Hourly Leq(h), dBA	Adjusted Hourly Leq(h), dBA[2]
Long-term Measurements						
LT1	2183 Lakeview Circle, Antioch	9/27/01	9:00 p.m.	24 hr	68.5	--
LT2	4008 Belle Drive, Antioch	9/25/01	11:00 a.m.	24 hr	73.9	--
LT3	1200 Buchanan Road, Antioch	9/25/01 9/08/03	8:00 p.m. 2:00 p.m.	24 hr	72.0 71.7	--
LT4	328 West Tregallas Road, Antioch	9/25/01	3:00 p.m.	24 hr	63.0	--
LT5	1117 Ames Court, Antioch	9/27/01	4:00 p.m.	24 hr	67.0	--
LT6	2700 Violet Court, Antioch	9/26/01	3:00 p.m.	24 hr	65.0	--
LT7[3]	281 Patricia Avenue, Pittsburg	9/25/01	5:00 a.m.	24 hr	68.1	--
LT8	43 Sunset Drive, Antioch	9/26/01 9/08/03	8:00 a.m. 11:00 a.m.	24 hr	62.0 63.5	--
Short-term Measurements						
ST1	2241 East Leland Road, Antioch	9/28/01	2:40 p.m.	20 min	63.1	67
ST2	1121 Lakeview Circle, Antioch	9/25/01	3:38 p.m.	20 min	64.0	68
ST3	2201 San Jose Drive, Antioch	9/27/01 9/28/01	3:50 p.m. 9:59 a.m.	20 min 20 min	69.0 69.1	70 70
ST4	1312 Buchanan Road, Antioch	9/28/01	3:35 p.m.	20 min	67.3	69
ST5	2 Wightman Court, Antioch	9/25/01	5:09 p.m.	20 min	67.0	68
ST6	220 East Tregallas Road, Antioch	9/25/01	4:38 p.m.	20 min	71.5	73
ST7	2701 Stamm Drive, Antioch	9/27/01	4:48 p.m.	20 min	70.0	70
ST8	2436 Mahogany Way, Antioch	9/27/01	9:05 a.m.	20 min	65.6	68
ST9	2416 Shadow Lane, Antioch	9/28/01	6:32 a.m.	20 min	59.2	63
ST10	2409 Peppertree Court, Antioch	9/28/01	7:05 a.m.	20 min	63.2	66
ST11	1000 Claudia Court, Antioch	9/28/01	7:35 a.m.	20 min	70.5	74
ST12	Marsh Elementary School, Antioch	9/25/01	8:50 a.m.	20 min	59.2	63
ST13	338 Drake Street, Antioch	9/28/01	8:11 a.m.	20 min	64.6	68
ST14	215 Sunset Drive, Antioch	9/26/01	9:50 a.m.	20 min	68.7	69
ST15	4316 Belle Road, Antioch	9/08/03	1:35 p.m.	20 min	73.4	74
ST16	909 Fitzuren Road, Antioch	9/09/03	4:30 p.m.	20 min	68.9	70
ST17	2300 Mahogony Way, Antioch	9/09/03	10:00 a.m.	20 min	75.0	76
ST18	34 Drake Street, Antioch	9/09/03	11:05 a.m.	20 min	68.6	69
ST19	2409 Sunset Drive, Antioch	9/10/03	9:40 a.m.	20 min	61.5	63

Notes:
1. The start time reported for the long term measurements is the hour in which the peak hour noise level occurred.
2. Measurements conducted during off-peak hours are adjusted to peak hour levels by comparison to the long-term measurement results at similar locations.
3. The measurement at LT7 was conducted at a second-row residence; therefore, the noise level was adjusted to represent the noise level at the first-row residence.

Source: Parsons, 2004.

2.2.6.3 Impacts

Noise impacts are assessed by comparing the future (year 2030) Build Alternative condition with the existing condition. The greatest noise generation from a roadway is when volumes are high and speeds are still close to free flow; this "worst case" condition is referred to as Level of Service C (LOS C) by traffic engineers. To approximate the worst case LOS C scenario for the Year 2030 Build condition, the noise analysis assumed freeway volumes of 1,800 vehicles-per-lane per hour traveling at approximately 105 km/h (65 mph). The volumes used for the HOV lanes were 1,500 vehicles per lane per hour at a speed of 105 km/h (65 mph). Actual year 2030 volumes were used for ramps, but they were capped at 1,000 vehicles per lane per hour, in order to maintain the greatest noise generation potential. The speeds used for ramp traffic were 56 km/h (35 mph) for straight ramps and 32 km/h (20 mph) for loop ramps.

The Caltrans highway noise prediction computer model, SOUND 2000, PC Version 3.2, was used for the noise computations. This model is based on the highway traffic noise prediction method specified in FHWA-RD-77-108 (FHWA, 1978). Table 2.2.6-2, Year 2030 Noise Prediction and Barrier Analysis, summarizes the results of the predicted levels at the representative receptor locations. As shown in the table, the predicted project peak hour Leq(h) at the single- and multi-family residences before any abatement would range from 69 to 80 dBA, exceeding the NAC. Traffic noise levels at churches, schools, and other outdoor recreational area would range from 61 to 76 dBA. Noise abatement measures were considered as described in Section 2.2.6.4, Avoidance, Minimization and Compensation Measures.

There are three hotels along the project alignment: Motel 6 (Receptors R4 and R4A), Ramada Inn (Receptors R23 and R24), and Best Western (Receptor R14). Receptors were placed at the pool areas of each of these hotels to represent the recreational outdoor land uses at the hotels. Predicted outdoor recreational noise levels were calculated at 61, 70 and 73 dBA; noise abatement measures are considered for the impacts exceeding the NAC.

Two of the hotels, the Motel 6 and Ramada Inn, have rooms with windows that face SR 4. Indoor noise levels were predicted at these locations by modeling the noise levels outside of the rooms and then applying a 20-dBA insertion loss to account for the noise reduction provided by the walls, windows, and doors of each room's facade (1994, Harris). The predicted peak-hour noise levels at these indoor locations were calculated to be 48 and 50 dBA, which is below the 52 dBA interior NAC for Activity Category E land uses. Noise abatement measures are not warranted for these indoor noise levels.

2.2.6.4 Avoidance, Minimization and Compensation Measures

Table 2.2.6-3 lists predicted noise levels without barriers and with barriers of various heights. Recommended barrier heights and locations are shown on Figure A (Sheets 1 through 12) in Appendix A. The following paragraphs summarize the traffic noise analysis, recommended abatement measures, and the respective representative receptor locations:

Barrier S241 (Receptors R1 through R3): Barrier S241 would abate traffic noise impacts at a group of single-family residences to the north of SR 4 and just west of the SR 4 / Loveridge Road Interchange. The predicted peak-hour noise levels at these receptors are 4 to 5 dBA higher than existing levels and range from 72 to 73 dBA, which would exceed the NAC of 67 dBA. A 3.7-meter (12-foot) to 3.0-meter (10-foot) high soundwall on the shoulder of westbound SR 4 would provide 6 to 8 dBA of noise reduction at these receptors.

Barrier S256 (Receptors R5 through R8): Barrier S256 would abate noise impacts at the Pheasant Ridge and the Lakeview Apartment complexes. The predicted peak hour noise levels at these receptors would exceed existing levels by 3 to 6 dBA and range from 72 to 75 dBA, exceeding the NAC of 67 dBA. A 2.4- to 3.0-meter (8- to 10-foot) high soundwall on the shoulder of eastbound SR 4 would effectively abate the peak hour traffic noise levels at the first-floor residences of the apartments. Raising the wall heights to 3.0 to 3.7 meters (10 to 12 feet) would provide at least a 5-dBA benefit to second-floor residences. This is due to the geometry of the site being such that the elevated freeway is actually level with the elevation of the second-floor units. As a result, the greater wall heights are recommended to abate impacts at the second-floor units.

Barrier S266 (Receptors R9 through R13): Receptors R9 through R13 represent a group of single-family residences on Belle Drive on the south side of SR 4. The predicted future noise levels at these residences would exceed existing noise levels by 3 to 6 dBA and range from 74 to 80 dBA, which would exceed the NAC. A 3.7-meter (12-foot) high soundwall on the shoulder of the south side of SR 4 would abate the noise impacts at these residences.

Barrier S274 (Receptor R14): Receptor R14 represents the pool area at the Best Western Hotel on Somersville Road. There is an existing 1.8-meter (6-foot) high block wall surrounding the pool area. Indoor noise levels were not predicted at this hotel since it does not have rooms with windows facing the freeway. The predicted future noise level at the pool area is 73 dBA, representing a 5-dBA increase over the existing noise level, which already exceeds the 67 dBA NAC for recreational outdoor land uses. A 3.0-meter (10-foot) high soundwall on the shoulder of the eastbound Somersville Road off-ramp would provide the required 5-dBA noise reduction.

Barrier S277 (Receptors R23 and R24): Receptors R23 and R24 represent the Ramada Inn on Somersville Road on the north side of SR 4. R23 represents the indoor noise level of a room facing the freeway, and R24 represents the outside level at the pool area. The predicted peak-hour noise level for the room is 50 dBA, which is below the 52 dBA NAC. The noise barrier is recommended to reduce noise levels at the pool area, where the predicted noise level without noise barriers is 70 dBA.

Barrier S278 (Receptors R15 and R16): Receptors R15 and R16 represent a group of multi-family residences on San Jose Drive on the south side of SR 4, just east of Somersville Road. The predicted future noise levels at these multi-family residences, without a barrier, range from 73 to 75 dBA, a 5-dBA increase over the existing noise levels, which already exceed the NAC. A 4.3-meter (14-foot) high barrier on the shoulder of the eastbound Somersville Road on-ramp would provide 8 dBA of noise reduction.

Barrier S283 (Receptors R25 through R29 and R29A): Barrier S283 would abate traffic noise impacts at multi-family residences and the Kindercare Learning Center located on the north side of SR 4 between Somersville Road and L Street. The predicted peak-hour noise levels at these receptors range from 71 to 76 dBA, exceeding the NAC. The noise level at Receptor R27 would exceed the existing level by more than 12 dBA, an increase that is defined as "substantial" by Caltrans Protocol. Barrier S283, which would range from 3.7 to 4.9 meters (12 to 16 feet) in height, would provide 6 to 7 dBA of noise reduction. The barrier would be located on the shoulder of SR 4 from Stations 279+15 to 280+45 and on the right-of-way (r/w) from Stations 280+45 to 287+40.

Barrier S284 (Receptors R17 through R22): Barrier S284 is recommended to abate traffic noise impacts at single- and multi-family residences on the south side of SR 4 between Somersville Road and L Street. The predicted peak-hour noise levels in this area range from 71 to 77 dBA, with an increase over existing noise levels of 5 to 7 dBA. A 3.0- to 3.7-meter (10- to 12-foot) high barrier on the r/w from Station 280+20 to 286+40 and on the shoulder of SR 4 from Station 286+40 to 288+40 would provide the optimal noise reduction.

Barrier S289 (Receptors R30 and R37): Barrier S289 along the north shoulder of the SR 4 bridge at L Street would reduce traffic noise levels at multi-family residences north of SR 4 at the L Street intersection. The predicted noise levels without barriers at the representative receivers are 69 and 71 dBA, representing an increase of 2 to 5 dBA over existing noise levels. A 4.3- to 3.7-meter (14- to 12-foot) high soundwall is recommended to reduce traffic noise below impact levels at R30.

Barrier S293 (Receptors R38 through R40): Barrier S293 along the shoulder and r/w on the north side of SR 4 would reduce traffic noise levels at residences and a school north of SR 4 between L and G Street. The predicted noise levels at these receptors are 71 to 74 dBA. A 2.4-meter (8-foot) high barrier would reduce traffic noise at R38 and R39 by the required 5 dBA. Receiver R40 would require a 3.7-meter (12-foot) high wall to achieve the same 5-dBA reduction due to its location.

Barriers S292 and S294 (Receptors R31A through R32): Barriers S292 and S294 would shield traffic noise at single-family residences along Fitzuren Road. The predicted noise levels without barriers at the representative receivers are 70 to 73 dBA, representing an increase of 2 dBA over existing levels. A combination of a 4.3-meter (14-foot) high and 4.3- to 3.7-meter (14- to 12-foot) high soundwall is recommended along the main lane and ramp shoulder on the southside of SR 4.

Barrier S298 (Receptors R33A through R35): Barrier S298 would shield traffic noise at single- and multi-family residences, two churches, and a school between Tregallas Road and SR 4. The predicted noise levels without barriers are 71 to 73 dBA, which would result in an 7- to 9-dBA increase over existing noise levels. The recommended 3.7- to 4.3- to 4.9-meter (12- to 14- to 16-foot) high noise barrier would reduce the predicted traffic noise below impact levels at three of the four representative receivers in this area. The barrier would be located at the r/w on the south side of SR 4.

Barrier S299 (Receptors R41 through R44): Barrier S299 is the recommended abatement measure for traffic noise at single-family residences north of SR 4 between G Street and the on-ramp from Lone Tree Way to SR 4. The predicted noise levels without barriers are 73 to 74 dBA at the representative receivers. This would result in an increase of 5 to 6 dBA over existing noise levels. A 4.9-meter (16-foot) high soundwall at the r/w is recommended.

Barrier S303 (Receptors R45 through R47): Barrier S303 is recommended to reduce traffic noise at single-family residences north of the Lone Tree to SR 4 on-ramp. The predicted noise level without barriers is 73 dBA, a 4-dBA increase over existing noise levels. A 4.3- to 3.7-meter (14- to 12-foot) high soundwall at the Lone Tree Way to westbound SR 4 loop on-ramp shoulder would effectively abate peak-hour traffic noise.

Barrier S304 (Receptors R36, R48, and R49): Barrier S304 is recommended to reduce traffic noise at single-family residences south of SR 4 near the Lone Tree Way interchange. The predicted noise levels without barriers at the representative receivers are 72 to 73 dBA, which would be 1 to 5 dBA above the existing noise levels. A 3.7-meter (12-foot) high soundwall is recommended at the main lane shoulder and across the Lone Tree Overpass bridge.

Barrier S309 (Receptors R58 through R62): Barrier S309, located along the shoulder of SR 4, would reduce traffic noise levels at single-family residences north of Sunset Drive from Lone Tree Way to just east of Cavallo Road. The predicted noise levels without barriers at the representative receivers are 70 to 72 dBA. These levels are up to 8 dBA above existing noise levels. A 3.0-meter (10-foot) high soundwall would effectively reduce peak-hour traffic noise at representative receptors.

Barrier S314 (Receptors R50 through R57): Barrier S314, located along the shoulder and r/w of SR 4, would reduce traffic noise levels south of Tregallas Road at single- and multi-family residences, churches, and a school between Lone Tree Way and Hillcrest Avenue. The predicted noise levels without barriers at the representative receivers are 73 to 76 dBA. A 4.3-meter (14-foot) high barrier is recommended for this area.

Barrier S317 (Receptors R63, R64, and R64A): Barrier S317 along the shoulder and r/w would reduce traffic noise levels at two churches and a single-family residence north of SR 4 near the southbound Hillcrest Avenue to westbound SR 4 on-ramp. The predicted noise levels without barriers at the representative receivers are 73 to 76 dBA, which would be 5 to 6 dBA above existing noise levels. A 3.7-meter (12-foot) high soundwall is recommended in this area.

Barrier S330 (Receptors R65 through R68): Barrier S330 along the r/w and shoulder of SR 4 would reduce traffic noise levels at sensitive single-family residences located on the south side of Tregallas Road and southeast of the SR 4 / Hillcrest Avenue Interchange. The predicted noise levels without barriers at the representative receivers are 71 to 77 dBA, representing an increase of 6 dBA above existing noise levels. A 4.3- to 3.7- to 3.0-meter (14- to 12- to 10-foot) high soundwall is recommended in this area.

Sound Barriers and Noise Reflection

The construction of noise barriers sometimes generates concern that single or parallel sound barrier configurations will provide surfaces that "bounce" noise, and thus increase noise levels for some receivers. Studies show that single barrier configurations (barriers on one side of the highway only) reflect noise toward the opposite side of the highway. The noise increase on the opposite side, however, is typically 1 to 2.4 dBA, which is barely perceptible to the human ear. Furthermore, for this project, land use opposite the proposed single barriers is commercial – no residences would be opposite single barriers, and no adverse noise effects would result from the construction of these walls.

Performance of parallel noise barriers (barriers running along opposite sides of the highway) can decrease slightly because of noise reflections between the two barriers. Performance degrades less than 3dbA when the ratio of the distance between opposite barriers to the height of the barriers is greater than ten to one. Because the distance to height ratio of barriers proposed for the SR 4 (East) Widening Project is greater than ten to one, the performance degradation of the parallel barriers would not be perceivable by the human ear. No adverse noise effects would result from the construction of these walls.

Table 2.2.6-3: Predicted Future Noise and Barrier Analysis

REC. NO.	MEAS. SITE NO.	LANDUSE [2]	EXISTING PEAK HOUR NOISE LEVELS	PREDICTED PEAK HOUR NOISE LEVELS[1]												BARRIER NO.	BARRIER LOCATION [8]
				WITHOUT BARRIER $L_{eq}(h)$	ACTIVITY CATEGORY and NAC ( )	IMPACT TYPE (S, A/E, or NONE)	NOISE PREDICTION WITH BARRIER AND BARRIER INSERTION LOSS (I.L.)											
							2.4 m (8 ft)		3.0 m (10 ft)		3.7 m (12 ft)		4.3 m (14 ft)		4.9 m (16 ft)			
			Leq(h), dBA	dBA	Leq(h), dBA		Leq(h)	I.L.	Leq(h)	I.L.	Leq(h)	I.L.	Leq(h)	I.L.	Leq(h)	I.L.		
West of Loveridge Road																		
R 1	--	SFR	68 E	72	B (67)	A/E	**67**	5	66 T	6	65 R	7	65	7	64	8	S241	SHLDR
R 2C	--	SFR	68 E	73	B (67)	A/E	**67**	6	66 T	7	65 R	8	64	9	63	10		
R 3	LT7	SFR	68 M	73	B (67)	A/E	68	5	**67** R, T	6	67	6	66	7	66	7		
Loveridge Road to Somersville Road																		
R 4	--	REC	--	61	B (67)	NONE	--	--	--	--	--	--	--	--	--	--	--	--
R 4A	--	HTL	44 E,6	48[6]	E (52)	NONE	--	--	--	--	--	--	--	--	--	--		
R 5	ST1	MFR	67 M	73/78*	B (67)	A/E	69/76* T	4/2*	**68**/75*	5/3*	**66/73*** R, 4	7/5*	65/72*	8/6*	64/71*	9/7*	S256	SHLDR
R 6C	--	MFR	69 E	75/78*	B (67)	A/E	**67/73*** T	8/5*	66/72*	9/6*	65/70* R, 4	10/8*	63/69*	12/9*	62/67*	13/11*		
R 7	LT1	MFR	69 M	72/77*	B (67)	A/E	68/73* T	4/4*	**66/72***	6/5*	64/70* R, 4	8/7*	63/68*	9/9*	62/67*	10/10*		
R 8A	ST2	MFR	68 M	73/75*	B (67)	A/E	**66/69***	7/6*	64/68* R, 3, T	9/7*	63/67*	10/8*	62/65*	11/10*	62/64*	11/11*		
R 8	--	MFR	68 E	73/74*	B (67)	A/E	**66**/70*	7/4*	**65/69*** R, 4, T	8/5*	64/68*	9/6*	63/68*	10/6*	62/67*	11/7*		
R 9	--	SFR	71 E	74	B (67)	A/E	70	4	70 T	4	**69** R	5	68	6	67	7	S266	SHLDR
R 10	ST15	SFR	73 M	76	B (67)	A/E	72	4	**71** T	5	69 R	7	68	8	67	9		
R 11	--	SFR	74 E	79	B (67)	A/E	**73** T	6	71	8	69 R	10	68	11	67	12		
R 12C	LT2	SFR	74 M	80	B (67)	A/E	**74** T	6	72	8	70 R	10	69	11	68	12		
R 13	--	SFR	74 E	80	B (67)	A/E	**74**	6	73 T	7	71 R	9	70	10	69	11		
R 14C	--	REC	68 E	73	B (67)	A/E	69	4	**67** R, T	6	67	6	66	7	66	7	S274	SHLDR
Somersville Road to Contra Loma Boulevard (L Street)																		
R 15	--	MFR	68 E	73	B (67)	A/E	**68**	5	67 T	6	66	7	65 R	8	64	9	S278	SHLDR
R 16C	ST3	MFR	70 M	75	B (67)	A/E	71	4	**70** T	5	68	7	67 R	8	66	9		
R 17	--	MFR	68 E	74	B (67)	A/E	70	4	**68** R, T	6	68	6	67	7	66	8	S284	SHLDR & R/W
R 18	--	SFR	67 E	74	B (67)	A/E	**67**	7	66 T	8	65 R	9	64	10	63	11		
R 19	--	SFR	64 E	71	B (67)	A/E	67	4	67	4	**66** R, T	5	65	6	64	7		
R 20C	ST4	SFR	69 M	76	B (67)	A/E	**71**	5	69 T	7	67 R	9	66	10	65	11		
R 21	--	SFR	71 E	77	B (67)	A/E	**72**	5	71 T	6	69 R	8	68	9	66	11		
R 22	LT3	SFR	72 M	77	B (67)	A/E	**68**	9	67 T	10	65 R	12	65	12	64	13		

Notes:

1 - Traffic noise from freeway only; other local noise sources are not included.

2 - Land Use: SFR - single-family residence; HTL - hotel; MFR - multi-family residence; REC - Recreational (pool or tennis court); SCH - school; CHC - church.

3 - Recommended to achieve the noise reduction requirement of adjacent receptors.

4 - Recommended to abate the noise impacts at second floor level.

5 - S = Substantial Increase (12 dB or more); A/E = Approach or Exceed NAC.

6 - I.L. of 20 dBA is applied to account for noise reduction due to building and window.

7 - Estimated based on the measurement at ST17, taken just outside of the property line of Kindercare (R25).

C - Critical design receiver used in the determination of abatement reasonableness.

R - Recommended height based on requirements of Caltrans Noise Analysis Protocol.

E - Estimated noise level based on measurements at a similar location.

M - Measured peak hour noise level. Short-term measurements have been adjusted to peak hour levels using the long-term measurements.

T - Height required to cut line of sight to the truck stack for ground level.

I.L. - Insertion Loss

* Second-floor noise level

Noise level in bold-faced font type indicates the minimum height required to achieve a 5-dBA reduction.

8 - SHLDR - shoulder of highway; R/W - right-of-way

Table 2.2.6-3: Predicted Future Noise and Barrier Analysis (continued)

REC. NO.	MEAS. SITE NO.	LANDUSE [2]	EXISTING PEAK HOUR NOISE LEVELS	PREDICTED PEAK HOUR NOISE LEVELS[1]											BARRIER NO.	BARRIER LOCATION [8]
				WITHOUT BARRIER $L_{eq}(h)$	ACTIVITY CATEGORY and NAC ( )	IMPACT TYPE (S, A/E, or NONE)	NOISE PREDICTION WITH BARRIER AND BARRIER INSERTION LOSS (I.L.)										
							2.4 m (8 ft)		3.0 m (10 ft)		3.7 m (12 ft)		4.3 m (14 ft)		4.9 m (16 ft)		
			Leq(h), dBA	dBA	Leq(h), dBA		Leq(h)	I.L.	Leq(h)	I.L.	Leq(h)	I.L.	Leq(h)	I.L.	Leq(h)	I.L.	
R 23	--	HTL	48 E, 6	50[6]	B (52)	NONE	--	--	--	--	--	--	--	--	--	--	S277	SHLDR
R 24[C]	ST8	REC	68 M	70	B (67)	A/E	67 T	3	66	4	66	4	**65** R	5	65	5		
R 25	ST17[7]	SCH	69 E	73	B (67)	A/E	70 T	3	69	4	**67** R	6	67	6	66	7	S283	SHLDR & R/W
R 26	--	MFR	65 E	72	B (67)	A/E	71	1	70 T	2	68	4	**67** R	5	66	6		
R 27[C]	ST9	MFR	63 M	76	B (67)	S	**71** T	5	69	7	67	9	66	10	65 R	11		
R 28	--	MFR	63 E	74	B (67)	A/E	70 T	4	**68**	6	67	7	66	8	65 R	9		
R 29	--	MFR	61 E	71	B (67)	A/E	68 T	3	67	4	66	5	**65** R	6	64	7		
R 29A	--	REC	64 E	71	B (67)	A/E	68	3	**67** T	4	65 R	6	65	6	64	7		
R 30[C]	ST10	MFR	66 M	71	B (67)	A/E	67	4	67 T	4	**66**	5	65 R	6	65	6	S289	SHLDR
Contra Loma Boulevard (L Street) to Lone Tree Way																		
R 31A	--	SFR	68 M	70	B (67)	A/E	67 T	3	66	4	66	4	**65** R	5	65	5	S294/S292	SHLDR
R 31	ST16	SFR	70 M	72	B (67)	A/E	68 T	4	**67**	5	66 R, 3	6	66	6	65	7	S294	SHLDR
R 32[C]	--	SFR	71 E	73	B (67)	A/E	69 T	4	**68**	5	67 R, 3	6	67	6	66	7		
R 33A	--	MFR	64 E	71	B (67)	A/E	68 T	3	**66**	5	65 R	6	64	7	63	8	S298	R/W
R 33[C]	--	SFR	65 E	73	B (67)	A/E	**67** T	6	66	7	64 R	9	63	10	63	10		
R 34	LT4	SFR	63 M	72	B (67)	A/E	72 T	0	70	2	68	4	**67** R	5	66	6		
R 35	--	SFR	63 E	72	B (67)	A/E	**72** T	0	70	2	68	4	**66**	6	65 R	7		
R 36[C]	ST5	SFR	68 M	73	B (67)	A/E	69	4	**68** T	5	67 R, 3	6	66	7	66	7	S304	SHLDR
R 37	--	MFR	67 E	69	B (67)	A/E	66	3	65 T	4	**64** R	5	63	6	62	7	S289	SHLDR
R 38	ST11	MFR	74 M	74	B (67)	A/E	**68** T	6	66	8	65 R	9	64	10	63	11	S293	SHLDR & R/W
R 39	--	MFR	73 E	73	B (67)	A/E	**68**	5	67 T	6	65 R	8	64	9	63	10		
R 40[C]	ST12	SCH	63 M	71	B (67)	A/E	**69** T	2	68	3	66	5	65 R	6	64	7		
R 41	--	SFR	67 E	73	B (67)	A/E	70 T	3	69	4	**68**	5	67	6	67 R, 3	6	S299	R/W
R 42	--	SFR	68 E	73	B (67)	A/E	70 T	3	69	4	**68**	5	66	7	65 R	8		
R 43[C]	ST13	SFR	68 M	74	B (67)	A/E	70 T	4	**69**	5	67	7	66	8	65 R	9		
R 44	--	SFR	68 E	74	B (67)	A/E	71	3	**69** T	5	68	6	66	8	65 R	9		
R 45[C]	--	SFR	69 E	73	B (67)	A/E	69	4	**68** T	5	66	7	65 R	8	65	8	S303	SHLDR
R 46	ST18	SFR	69 M	73	B (67)	A/E	69	4	**68** T	5	67	6	66 R, 3	7	66	7		
R 47	--	SFR	69 E	73	B (67)	A/E	69	4	68 T	5	**67** R	6	67	6	67	6		

Notes:

1 - Traffic noise from freeway only; other local noise sources are not included.

2 - Land Use: SFR - single-family residence; HTL - hotel; MFR - multi-family residence; REC - Recreational (pool or tennis court); SCH - school; CHC - church.

3 - Recommended to achieve the noise reduction requirement of adjacent receptors.

4 - Recommended to abate the noise impacts at second floor level.

5 - S = Substantial Increase (12 dB or more); A/E = Approach or Exceed NAC.

6 - I.L. of 20 dBA is applied to account for noise reduction due to building and window.

7 - Estimated based on the measurement at ST17, taken just outside of the property line of Kindercare (R25).

C - Critical design receiver used in the determination of abatement reasonableness.

R - Recommended height based on requirements of Caltrans Noise Analysis Protocol.

E - Estimated noise level based on measurements at a similar location.

M - Measured peak hour noise level. Short-term measurements have been adjusted to peak hour levels using the long-term measurements.

T - Height required to cut line of sight to the truck stack for ground level.

I.L. - Insertion Loss

* Second-floor noise level

Noise level in bold-faced font type indicates the minimum height required to achieve a 5-dBA reduction.

8 - SHLDR - shoulder of highway; R/W - right-of-way

Table 2.2.6-3: Predicted Future Noise and Barrier Analysis (continued)

REC. NO.	MEAS. SITE NO.	LANDUSE [2]	EXISTING PEAK HOUR NOISE LEVELS	PREDICTED PEAK HOUR NOISE LEVELS [1]											BARRIER NO.	BARRIER LOCATION [8]
				WITHOUT BARRIER $L_{eq}(h)$	ACTIVITY CATEGORY and NAC ( )	IMPACT TYPE (S, A/E, or NONE)	NOISE PREDICTION WITH BARRIER AND BARRIER INSERTION LOSS (I.L.)									
							2.4 m (8 ft)		3.0 m (10 ft)		3.7 m (12 ft)		4.3 m (14 ft)		4.9 m (16 ft)	
			$L_{eq(h)}$, dBA	dBA	$L_{eq(h)}$, dBA		$L_{eq(h)}$	I.L.	$L_{eq(h)}$	I.L.	$L_{eq(h)}$	I.L.	$L_{eq(h)}$	I.L.	$L_{eq(h)}$	I.L.		
Lone Tree Way to Hillcrest Avenue																		
R 48	--	SFR	70 E	72	B (67)	A/E	69	3	68 T	4	**67** R	5	66	6	66	6	S304	SHLDR
R 49	--	SFR	72 E	73	B (67)	A/E	69	4	**68** T	5	66 R	7	66	7	65	8		
R 50	ST6	SFR	73 M	74	B (67)	A/E	**69**	5	67 T	7	66	8	65 R	9	64	10	S314	SHLDR & R/W
R 51	--	SFR	73 E	73	B (67)	A/E	**68** T	5	67	6	66	7	65 R	8	64	9		
R 52	--	SFR	72 E	73	B (67)	A/E	**68** T	5	67	6	65	8	64 R	9	63	10		
R 53	ST7	SFR	70 M	74	B (67)	A/E	**65** T	9	67	7	66	8	65 R	9	64	10		
R 54 C	--	SFR	72 E	76	B (67)	A/E	**66** T	10	69	7	68	8	66 R	10	65	11		
R 55	--	CHC	71 E	76	B (67)	A/E	72	4	**67** T	9	69	7	67 R	9	66	10		
R 56	LT5	SFR	67 M	75	B (67)	A/E	71 T	4	**69**	6	68	7	67 R	8	66	9		
R 57	--	SFR	67 E	73	B (67)	A/E	**68** T	5	67	6	66	7	65 R	8	64	9		
R 58	--	SFR	67 E	72	B (67)	A/E	**66** T	6	65 R, 3	7	64	8	63	9	63	9	S309	SHLDR
R 59 C	LT8	SFR	64 M	72	B (67)	A/E	**67**	5	65 R, T	7	64	8	63	9	62	10		
R 60	--	SFR	67 E	71	B (67)	A/E	**66** T	5	65 R, 3	6	64	7	63	8	62	9		
R 61	--	SFR	68 E	71	B (67)	A/E	**66** T	5	65 R	6	64	7	63	8	63	8		
R 62	ST14	SFR	69 M	70	B (67)	A/E	66 T	4	**65** R	5	65	5	64	6	64	6		
R 63	--	CHC	70 E	75	B (67)	A/E	72	3	71 T	4	**70** R	5	69	6	68	7	S317	SHLDR & R/W
R 64	--	CHC	67 E	73	B (67)	A/E	70	3	69	4	**68** R, T	5	68	5	67	6		
R 64A C	--	SFR	71 E	76	B (67)	A/E	72	4	**71** T	5	70 R, 3	6	69	7	68	8		
East of Hillcrest Avenue																		
R 65	--	SFR	69 E	75	B (67)	A/E	72 T	3	71	4	71	4	**70** R	5	70	5	S330	SHLDR & R/W
R 66 C	--	SFR	71 E	77	B (67)	A/E	73 T	4	**72**	5	70 R, T	7	69	8	68	9		
R 67	LT6	SFR	65 M	71	B (67)	A/E	71	0	69 R, 3, T	2	68	3	67	4	67	4		
R 68	--	SFR	67 E	73	B (67)	A/E	70	3	**68** R, T	5	67	6	67	6	66	7		

Notes:

1 - Traffic noise from freeway only; other local noise sources are not included.

2 - Land Use: SFR - single-family residence; HTL - hotel; MFR - multi-family residence; REC - Recreational (pool or tennis court); SCH - school; CHC - church.

3 - Recommended to achieve the noise reduction requirement of adjacent receptors.

4 - Recommended to abate the noise impacts at second floor level.

5 - S = Substantial Increase (12 dB or more); A/E = Approach or Exceed NAC.

6 - I.L. of 20 dBA is applied to account for noise reduction due to building and window.

7 - Estimated based on the measurement at ST17, taken just outside of the property line of Kindercare (R25).

C - Critical design receiver used in the determination of abatement reasonableness.

R - Recommended height based on requirements of Caltrans Noise Analysis Protocol.

E - Estimated noise level based on measurements at a similar location.

M - Measured peak hour noise level. Short-term measurements have been adjusted to peak hour levels using the long-term measurements.

T - Height required to cut line of sight to the truck stack for ground level.

I.L. - Insertion Loss

* Second-floor noise level

Noise level in bold-faced font type indicates the minimum height required to achieve a 5-dBA reduction.

8 - SHLDR - shoulder of highway; R/W - right-of-way

2.2.7 Energy

As the SR 4 project has no potential for substantial energy impacts, in accordance with Caltrans' Standard Environmental Reference Guidelines,[3] only a qualitative energy analysis was conducted. The information presented in this section is taken from the technical memorandum, *Technical Memorandum on Energy Impacts for the State Route 4 (East) Widening Project: Loveridge Road to State Route 160* (Parsons, 2003).

The energy impacts of transportation projects are typically divided into two components: (1) the direct energy required for ongoing operations, in this case, the use of petroleum-based fuels and alternative fuels for motor vehicle travel within the project area, and (2) the indirect energy required to produce the materials for and to carry out construction of the project. In the long term, the direct, or operating, energy requirements are usually greater and of primary importance. This discussion, therefore, focuses on the direct energy requirements for ongoing SR 4 operations with and without the proposed project.

The project would increase capacity, improve roadway operations, and encourage the use of transit and carpooling along SR 4 from west of the Loveridge Road Interchange to east of the Hillcrest Avenue Interchange. Without any improvements to SR 4 (that is, under the No-Build Alternative), congestion in the westbound direction is expected to grow to 13 hours per day by 2030, essentially all day through both the morning and evening peak periods. The Build Alternative would reduce westbound congestion to about one hour in the morning and similarly in the evening peak periods in the eastbound direction. The Build Alternative would reduce the duration of evening peak-period congestion from seven hours to less than one hour per day. Unlike the No-Build Alternative, the Build Alternative will be able to serve the entire 2030 peak-hour demand. The Build Alternative would improve average travel speeds, and thereby, reduce average travel times during all time periods. It would also decrease vehicle delay in the peak directions by about 80 percent. Essentially, traffic conditions would improve from relatively stop-and-go conditions for most of the day for the No-Build Alternative to more energy-efficient, free-flow conditions for the Build Alternative.

The increased peak-hour demand served by the Build Alternative does not imply an increase in daily traffic as a result of the project. By 2030, without any improvements to the SR 4 study area, the freeway will not be able to serve the projected peak hour demand. This gives rise to "overflow demand," vehicles which because they cannot "fit" into the peak hour, would spread into the adjacent hours. Implementation of the Build Alternative would improve traffic conditions in the SR 4 study area, and no overflow demand would result. Thus, for 2030 "Build" Conditions, the demand served during the peak hour would increase, but total daily travel demand would remain more or less the same.

Improved traffic operations under the Build Alternative would reduce direct or operating energy use, whether in the form of petroleum fuels or alternative sources of energy, compared to No-Build

[3] Source: http://www.dot.ca.gov/ser/vol1/sec3/physical/ch13energy/chap13.htm

conditions. Thus, the proposed project is anticipated to have a beneficial effect on direct energy use compared to the No-Build Alternative. No energy mitigation measures would be needed.

2.3 Biological Environment

A Draft Natural Environment Study (NES) / Biological Assessment (BA) (Parsons 2004), a Preliminary Wetland Delineation Report (Parsons 2002), *and an Addendum to the NES/BA (Parsons 2005)* were prepared for the State Route 4 (East) Widening Project. The studies consisted of a comprehensive records and literature search, a reconnaissance survey of the entire project corridor, habitat assessment and protocol surveys for special status species, and a delineation/ assessment of wetlands and other waters of the United States (U.S.). This section of the environmental document presents the findings of these reports and studies for wetlands and other waters of the United States, vegetation and wildlife communities, threatened and endangered species, and invasive vegetative species.

2.3.1 Wetlands and Other Waters of the United States

2.3.1.1 Regulatory Setting

As established in Section 404 of the Clean Water Act (33 U.S.C. 1344), the U.S. Army Corps of Engineers (ACOE) has final authority over the identification of wetlands and other waters of the U.S. in the project vicinity, including their jurisdiction, determination of area affected by the project, and type of permits and conditions required. Section 301 of the Clean Water Act prohibits the discharge of dredged or fill material into waters of the United States without a permit from the ACOE. Ditching, filling, or other activities that could alter the physical, chemical, biological, or public interest values (as defined by 40 CFR 230 Subparts C-F) associated with wetlands and other waters of the U.S. are considered impacts under ACOE authority. A “no net loss of wetland acreage or value” policy is established within both the state and federal executive branches.

2.3.1.2 Affected Environment

A delineation of wetlands and other waters of the U.S. in the SR 4 (East) Widening project vicinity was conducted on May 16, 2001, August 1, 2001, October 24, 2001, and February 25, 2002, in accordance with the Routine On-Site Determination Method as defined by the ACOE. This delineation was submitted to the ACOE for jurisdictional determination on March 15, 2002, and the ACOE returned its jurisdictional determination on July 10, 2002. A copy of the ACOE’s letter is provided in Section 3.3, Correspondence.

Based on the delineation as confirmed by the ACOE, a total of 1.037 acres of wetland and other waters of the U.S. occur at the following locations along the project corridor:

- West Kirker Creek;
- East Kirker Creek;
- An unnamed drainage located east of Loveridge Road;
- Los Medanos Wasteway;
- Markley Creek;
- West Antioch Creek; and
- East Tributary of East Antioch Creek.

The functions and values of the wetlands within the SR 4 corridor are limited by their small size, fragmentation, and isolation from other wetland systems. The freshwater marsh systems offer minimal attenuation of high flows due to their small cross-sectional areas and short length within the project right-of-way. The creeks within the project area are likely to have highly fluctuating hydrology due to the small size of their drainages and the amount of impervious surfaces upstream of SR 4. The narrow channel and steep banks observed along most of the creeks suggest that there would be little opportunity for flow attenuation, runoff storage and groundwater recharge. Sediment capture is limited in most of the channels by the lack of emergent vegetation and scouring caused by high flow velocities.

Habitat values of the wetland sites in the SR 4 corridor are also limited by the lack of connectivity with other habitats and the lack of meaningful upland-wetland ecotones or riparian vegetation. Plant and animal species observed in the wetland habitats are generalists that inhabit a broad spectrum of environments. Only one species of amphibian, a bullfrog, was observed (West Antioch Creek) during the field surveys. No additional species of amphibians or reptiles were observed during protocol surveys for the California red-legged frog, as described in Section 2.3.3, Threatened and Endangered Species.

On April 1, 2005, the United States Fish and Wildlife Service (USFWS) conducted a field review of the SR 4 (East) Widening Project area and determined that West Antioch Creek at the SR 4 / Contra Loma Boulevard–L Street Interchange is potential habitat for California red-legged frog. Refer to the USFWS Biological Opinion in Appendix F and Section 2.3.3, Threatened and Endangered Species, in this environmental document for further information.

2.3.1.3 Impacts

There would be no impacts to wetlands and other waters of the U.S. from the No-Build Alternative, except for the effects of routine maintenance; this section therefore focuses on impacts of the Build Alternative. The Build Alternative would permanently affect 0.4383 acres and temporarily affect 0.0337 acres of wetlands and other waters of the U.S. (for a combined total of 0.4720 acres). Both permanent and temporary (construction phase) impact areas are shown on Figures A- (Sheets 1 through 12) in Appendix A. Table 2.3.1-1, Impacts to Wetlands and Other Waters of the U.S., summarizes the acreages of wetlands and other waters in the immediate project vicinity and the amounts that would be permanently or temporarily affected in comparison with the total acreage of

such resources within the project limits at the various locations identified. Mitigation is discussed in the following section.

Table 2.3.1-1: Impacts to Wetlands and Other Waters of the U.S. from SR 4 Project Build Alternative

	Location	Acres*		
		Total in Immediate Project Vicinity	**Permanently Affected by Project**	**Temporarily Affected by Project (Construction Phase)**
Wetlands	*West Kirker Creek*	0.1529	0.0750	0.0075
	Unnamed Drainage (East of Loveridge)	0.0291	0.0182	0.0000
	East Kirker Creek (Also called "Old" Kirker Creek)	0.0199	0.0134	0.0000
	West Antioch Creek	0.4873	0.0844	0.0176
	"Old" West Antioch Creek	0.0738	0.0738	0.0000
	Total Wetlands	**0.7630**	**0.2648**	**0.0251**
Other Waters of U.S.	*West Kirker Creek*	0.1003	0.0462	0.0000
	East Kirker Creek (Also called "Old" Kirker Creek)	0.0169	0.0169	0.0000
	Los Medanos Wasteway	0.0721	0.0484	0.0086
	Markley Creek	0.0183	0.0000	0.0000
	West Antioch Creek	0.0663	0.0619	0.0000
	Total Other Waters of the U.S.	**0.2740**	**0.1735**	**0.0086**
Total Wetlands/Waters		**1.0370**	**0.4383**	**0.0337**

* Project effects are less than total wetland area.

2.3.1.4 Avoidance, Minimization and Compensation Measures

Mitigation requirements for impacts to wetlands and other waters of the U.S. will be determined through consultation with the ACOE, which will establish the mitigation ratio and other measures to be implemented, based on its review of this Environmental Assessment / Initial Study, the Wetlands Delineation Report, and the Natural Environment Study. Mitigation measures will be identified for both permanent and temporary (construction phase) impacts of the project to ensure no net loss of wetlands. The ACOE's review will be completed and the final mitigation measures identified before the Mitigated Negative Declaration / Finding of No Significant Impact is approved.

Based upon the poor quality of the affected areas as habitat, it is anticipated that wetlands would be replaced at a ratio of no more than 1:1. Given the level of estimated impact, the project is expected to qualify for a Nationwide 404 Permit 14 for linear transportation projects and a Nationwide 404 permit 33 for temporary construction, access, and dewatering. The 404 permits would be obtained

during the final design phase of the project and prior to any construction activities. An individual 404 permit is not required, and the NEPA-404 integration process is not needed.[4]

As reported in the foregoing section, 0.47 total acres of wetlands/waters would be permanently affected by the SR 4 (East) Widening project. CCTA's preferred mitigation strategy is to provide compensatory mitigation through the purchase of credits from an established wetlands conservation bank *or a contribution to an ACOE-approved land trust*. Regulatory agencies may authorize credits when on-site compensation is either not practical or use of a mitigation bank is environmentally preferable to on-site mitigation. Further, the Transportation Equity Act for the 21st Century (TEA-21) mandates a preference for wetlands mitigation banking to compensatory mitigation requirements under Section 404 of the Clean Water Act.[5] In the case of the SR 4 project, given the fragmented and isolated nature of the remaining wetlands in the highway corridor, the low likelihood of achieving long-term viability in replacement wetlands along the highway, and the difficulty and cost of ongoing maintenance, purchasing mitigation credits *or contributing to a land trust* provides an opportunity to conserve wetlands in a manner that is both more holistic and has a higher chance of success.

If a mitigation bank *is* used for project-specific mitigation, *its service area* should be in the watershed and county of the affected wetlands. There are two conservation banks in the greater project vicinity with credits available that could mitigate for the wetlands/waters losses resulting from the SR 4 (East) Widening project, as follows:

- The Kimball Island Conservation Bank, a 109-acre preserve located on Kimball Island in the Delta, at the confluence of the San Joaquin and Sacramento Rivers. The Kimball Island Bank reestablishes wetland and riparian habitats, including riverine aquatic bed, riparian forest, tidal perennial marsh, shaded riverine aquatic, and shallow water marsh. The Kimball Island bank site is located approximately four miles northwest of the project and shares the same watershed as the project wetlands. Because the Kimball Island Conservation Bank is located in Sacramento County, it is approved by the Sacramento District of the ACOE, but not the San Francisco District. The SR 4 project corridor falls within both the Sacramento District and the San Francisco District of the ACOE. (The ACOE District of San Francisco verified the wetland delineation for the project.) Credits for shallow water marsh are available for the Kimball Island Conservation Bank through Wildlands, Inc. The cost per wetland acre is $75,000.
- The Springtown Reserve is a 92.5-acre reserve located in Alameda County, approximately forty-five miles from the project site, and outside the project area watershed. The reserve has credits available for seasonal and alkaline wetlands. The Springtown Reserve has been approved by CDFG but is not yet approved by the ACOE. It is anticipated that the ACOE will grant approval by next year. The reserve has approximately nine acres of seasonal wetlands still available.

[4] As documented in Chapter 3, Section 3.2.3, Consultation pursuant to the Western States MOU for Integrated NEPA-404 Processing, the NEPA-404 Integration Process was initiated and subsequently discontinued when it developed that wetland impacts would not be sufficient to require an individual Section 404 permit.

[5] "Federal Guidance on the Use of the TEA-21 Preference for Mitigation Banking to Fulfill Mitgation Requirements under Section 404 of the Clean Water Act", US EPA, US ACOE, and US DOT, July 11, 2003.

Credits can be purchased through the Environmental Mitigation Exchange Company. The cost per wetland acre is $225,000.

Another option is a financial contribution to the Muir Heritage Land Trust, for the acquisition of wetlands to be preserved in perpetuity. The Muir Heritage Land Trust acquires and preserves undeveloped land in Contra Costa County, including existing wetlands and wildlife habitat.

Purchase of mitigation credits *or land* as compensation for impacts of the SR 4 project would be subject to consultation with *ACOE and other involved resource agencies.* If the agencies concur, CCTA's *purchase would be* in accordance with ratios established by the ACOE to ensure no net loss of wetlands.

In the event that these agencies do not concur in the purchase of conservation bank credits *or land* as compensatory mitigation for the wetlands/waters impacts of the project, CCTA would*, with Caltrans' review and approval, investigate other sites acceptable to ACOE for restoration, creation, or enhancement of* in-kind wetlands as compensatory mitigation. If replacement wetlands are created, wetlands permanently lost due to placement of new roadway or bridge structures would be replaced by creating additional stream-side or seasonal wetlands. A *potential* site for the creation *or enhancement* of a mitigation wetland exists along the project corridor in the Contra Loma Boulevard–L Street interchange area. The site, which totals 1.92 acres, is located along West Antioch Creek, which is highly maintained by the Contra Costa County Flood Control District (CCCFCD). Existing vegetation consists of non-native grasses and weeds that are regularly mowed by CCCFCD.

2.3.2 Vegetation and Wildlife Communities

2.3.2.1 Affected Environment

SR 4 (East) is located in an area that includes both commercial and residential development. Four biotic communities occur in the vicinity of the proposed widening: freshwater emergent wetland, non-native grassland, ruderal/disturbed, and windrow species.

Freshwater Emergent Wetland

Small freshwater marshes occur along the perimeter of West Kirker Creek, East Kirker Creek, an unnamed drainage north of Loveridge Road, and West Antioch Creek. Cattail (*Typha* ssp.), bulrush (*Scirpus* ssp.), and sedges (*Carex* ssp.) dominate freshwater marsh communities, which provide food, cover, and water for a variety of birds, mammals, reptiles, and amphibians. Species that could utilize freshwater marsh communities in Eastern Contra Costa County include Pacific tree frogs (*Hyla regilla*), bullfrogs (*Rana catsbiana*), California red-legged frog (*Rana aurora draytonii*), giant garter snake (*Thamnophis gigas*), and western pond turtle (*Clemmys marmorata*). The habitat within the project vicinity, however, appears to be of marginal to low quality. The following species were encountered in freshwater emergent wetland habitat during field surveys: beaver (*Castor canadensis*), mosquito fish (*Gambusia affinis*), bullfrogs, and Pacific tree frogs. No California red-legged frog, giant garter snake, or western pond turtle were observed during habitat assessment or protocol-level surveys; see Section 2.3.3, Threatened and Endangered Species.

Non-native Grasslands

Non-native grasslands occur intermittently along SR 4. This community is primarily composed of non-native annual grasses; however, a number of native annual forbs ("wildflowers") may also be present during years of favorable precipitation. Characteristic species include *Avena* spp., *Bromus* spp., Italian ryegrass (*Lolium multiflorum*), California poppy (*Eschscholzia californica*), lupine (*Lupinus* spp.), and baby blue-eyes (*Nemophila menziesii*).

Grasslands provide foraging and nesting habitat for a wide variety of wildlife species including raptors, seed eating birds, small mammals, amphibians, and reptiles. Wildlife species typically associated with grasslands include western skink (*Eumeces skiltonianus*), Pacific gopher snake (*Pituophis melanoleucus catenifer*), common garter snake (*Thamnophis sirtalis*), deer mouse (*Peromyscus maniculatus*), western harvest mouse (*Reithrodontomys megalotis*), California vole (*Microtus californicus*), black-tailed deer (*Odocoileus hemionus*), western meadowlark (*Sturnella neglecta*), and savannah sparrow (*Passerculus sandwichensis*). Grasslands also provide important foraging habitat for raptors such as the American kestrel (*Falco sparverius*), white-tailed kite (*Elanus leucurus*), northern harrier (*Circus cyaneus*), and red-tailed hawk (*Buteo jamaicensis*).

The following wildlife species were encountered in non-native grassland habitat during field surveys: western fence lizard (*Sceloporus occidentalis*), turkey vulture (*Cathartes aura*) (fly-over), white-tailed kite (fly-over), northern harrier (fly-over), Swainson's hawk (*Buteo swainsoni*) (fly-over), American kestrel (fly-over), and California ground squirrel (*Otospemophilius beecheyi*).

Ruderal/Disturbed and Croplands

Ruderal/disturbed communities occur intermittently along SR 4, both within and adjacent to the project right-of-way. This community type encompasses urban development, highly disturbed vegetation communities, highly eroded/disturbed areas, erosion control areas, and active or fallow croplands. A distinguishing characteristic of urban habitats is the mixture of native and exotic plant species. Exotic plant species may provide valuable habitat elements such as cover for nesting and roosting, as well as food sources such as nuts or berries (McBride and Reid 1988). In addition, native and introduced animal species that are tolerant of human activities often thrive in urban habitats. These species include western fence lizard (*Sceloporus occidentalis)*, barn swallow (*Hirundo rustica*), European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), house mouse (*Mus musculus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and Virginia opossum (*Didelphis virginianus*). Cropland habitats may either be annual or perennial depending upon the crop-rotation system and geographic location. Examples of wildlife that have adapted to croplands include red-winged blackbird (*Agelaius phoeniceus*), Brewer's blackbird (*Euphagus cyanocephalus*), American goldfinch (*Carduelis tristis*), house mouse, and deer mouse.

The ruderal/disturbed areas observed in the SR 4 corridor typically had a high incidence of exotic plant invasion. Commonly identified exotics included fennel (*Foeniculum vulgare*), black mustard (*Brassica nigra*), and thistles. Wildlife species encountered in ruderal/disturbed habitat during field

surveys were Pacific gopher snake (road kill), common kingsnake (*Lampropeltis getulus*) (road kill), Virginia opossum, and western fence lizard.

Windrow

Typically located in the vicinity of urban development, windrows can be found adjacent to roads and highways throughout California. Although they are not commonly designated as plant communities, windrows can provide habitat for multiple species and are therefore addressed herein. Windrows occur intermittently along SR 4, both within and adjacent to the roadway right-of-way. This community consists of various tree species that have been planted for ornamental or commercial purposes. Windrows may provide roosts, perches, and nest sites for various bird species, particularly raptors (Pearson 1988). Litter layers created by the exfoliated bark of Eucalyptus trees may also provide cover for small vertebrate species, such as southern alligator lizard (*Gerrhonotus multicarinatus*), gopher snake (*Pitouphis melanoleucus*), and woodrats (*Neotoma* spp.) (Pearson 1988). Other species that may be encountered include red-tailed hawk, red shouldered hawk (*Buteo lineatus*), barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), chestnut-backed chickadee (*Poecile rufescens*), and American crow (*Corvus brachyrhynchos*). Windrows of Eucalyptus may also provide wintering sites for monarch butterflies (*Danaus plexippus*).

The following wildlife species were encountered in windrow habitats during field surveys: Western scrub-jay (*Aphelocoma californica*), American crow, cliff swallow (*Petrochelidon pyrrhonota*), northern mockingbird (*Mimus polyglottos*), European starling, and house sparrow.

2.3.2.2 Impacts

Linear patches and disjunct segments of non-native grasslands, ruderal/disturbed vegetation, and windrow communities would be permanently affected by SR 4 (East) project construction. These losses are not considered to be substantially adverse because other vegetation community areas within the project vicinity are of higher quality and would be used by wildlife as an alternative and preferable habitat source. No mitigation is proposed.

2.3.2.3 Avoidance, Minimization and Compensation Measures

Because other vegetation community areas in the project vicinity are of higher quality than those along SR 4 and could be used by wildlife as an alternative habitat source, the loss of linear segments of vegetation along SR 4 within the project limits would not constitute a substantial adverse effect or require specific mitigation. Wetland impacts would be mitigated as described in Section 2.3.1.4.

2.3.3 Threatened and Endangered Species

2.3.3.1 Regulatory Setting

A variety of laws seek to identify, avoid, minimize and mitigate for impacts to special status wildlife and plant species, as summarized in the following paragraphs.

Federal Endangered Species Act

The Secretary of the Interior and the Secretary of Commerce are responsible under the Federal Endangered Species Act of 1973 (ESA) for identifying endangered and threatened species and their critical habitats, carrying out programs for species conservation, and rendering opinions regarding the impact of proposed federal actions on endangered species. The ESA also outlines what constitutes unlawful taking, importation, sale, and possession of endangered species and specifies civil and criminal penalties for unlawful activities.

Biological assessments are required under Section 7(c) of the ESA if listed species or critical habitat may be present in the area affected by any major construction activity conducted by, or subject to issuance of a permit from, a federal agency as defined in Part 404.02. Under Section 7(a)(3) of the ESA, every federal agency is required to consult with the United States Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) on a proposed action if the agency determines that its undertaking may affect an endangered or threatened species.

Migratory Bird Treaty Act

The Federal Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703-711) makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird listed in 50 CFR Part 10, including feathers or other parts, nests, eggs, or products, except as allowed by implementing regulations (50 CFR 21).

California Endangered Species Act

The California Endangered Species Act (CESA, Fish and Game Code Sections 2050-2098) established a State policy to conserve, protect, restore, and enhance any endangered or threatened species and its habitat. The Fish and Game Commission is charged with establishing a list of endangered and threatened species. State agencies must consult with the California Department of Fish and Game (CDFG) to determine if a proposed project is likely to jeopardize the continued existence of any endangered or threatened species.

The California Fish and Game Code defines “take” (Section 86) and prohibits “taking” of a species listed as endangered or threatened under CESA, except as the California Department of Fish and Game may issue a permit to authorize take for scientific, educational or management purposes or take that is incidental to otherwise lawful activities.

California Fish and Game Code Native Plant Protection Policy

The goals of Chapter 10 of the California Native Plant Protection Policy are to preserve, protect, and enhance endangered or rare native plants of this state (Section 1900). For purposes of this chapter, a ‘native plant’ means a plant that grows in a wild uncultivated state, which is normally found native to the plant life of the state (Section 1901). The California Fish and Game Commission may adopt regulations governing the taking, possession, propagation, transportation, exportation, importation, or sale of any endangered or rare native plants.

All state departments and agencies are, in consultation with the CDFG, to use their authority in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered or rare native plants. Such programs include, but are not limited to, the identification, delineation, and protection of habitat critical to the continued survival of endangered or rare native plants (Section 1911).

Streambed Alteration: California Fish and Game Code Section 1602

The CDFG also regulates activities that may affect streambeds. Division 2, Chapter 6, Section 1601 of the California Fish and Game Code states that "...general plans sufficient to indicate the nature of a project for construction by, or on the behalf of, any government agency, state or local, and any public utility, of any project which will divert, obstruct or change the natural flow or bed, channel, or bank of any river, stream, or lake designated by the Department in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit, or will use material from the streambeds designated by the Department, shall be submitted to the Department." Such actions are required to obtain an executed Streambed Alteration Agreement from CDFG.

2.3.3.2 Affected Environment

California Red-Legged Frog

The California red-legged frog is federally listed as Threatened and state-listed as a Species of Special Concern. This species inhabits a variety of aquatic, upland, and riparian environments, including ephemeral and permanent ponds, seasonal wetlands, perennial creeks, intermittent streams, manmade aquatic features, riparian corridors, blackberry thickets, non-native annual grasslands, and oak savannahs (USFWS 2000b). The California red-legged frog appears to be capable of using almost any aquatic system, given a permanent source of water and a lack of non-native predators.

The quality of California red-legged frog habitat in the SR 4 (East) project vicinity is extremely low and highly fragmented, and no historic records or studies indicate that the species occurs within the project limits. Although the field habitat assessment indicated that moderately suitable habitat for California red-legged frog occurs in West Kirker Creek, East Kirker Creek, the unnamed drainage, and West Antioch Creek, there are only 14 records of occurrences of the species within the five quadrangles through which the project corridor traverses, and none are within the immediate project vicinity. Parsons conducted two daytime and two nighttime field surveys for California red-legged frog in accordance with USFWS protocol requirements on May 6 and June 26, 2003 (daytime surveys) and May 7 and June 10, 2003 (nighttime surveys). These protocol-level species surveys included all potential habitat within the project limits and did not identify any California red-legged frogs.

On April 1, 2005, the United States Fish and Wildlife Service (USFWS) conducted a field review of the SR 4 (East) Widening Project area. In its Biological Opinion, USFWS concluded that the area at West Antioch Creek at the SR 4 / Contra Loma Boulevard–L Street Interchange "contains components that can be used by the California red-legged frog for feeding, resting, mating, movement corridors, and other essential behaviors. Therefore, [USFWS] believes that the California

red-legged frog is reasonably certain to occur within the action area..." See Section 2.3.3.3 for affected areas and refer to the USFWS Biological Opinion in Appendix F of this environmental document for further information.

Pond Turtle

Both the western and southwestern pond turtle are currently identified as Species of Concern by the USFWS and as Species of Special Concern by the CDFG and are Fully Protected under the provisions of the CDFG Code. The SR 4 (East) Widening project would result in permanent impacts to freshwater emergent wetlands at West Kirker Creek, East Kirker Creek, the unnamed drainage, and West Antioch Creek, areas that appear to provide suitable habitat for pond turtle, however, there are only nine records of occurrences of the species within the five quadrangles through which the project corridor traverses. None of these occurrences were within the project vicinity, and no pond turtles were observed during detailed surveys of all suitable habitat areas within the project limits.

Giant Garter Snake

The giant garter snake (*Thamnophis gigas*) is listed as Threatened at both the state and federal level. As part of the recovery effort for this species, the Central Valley was divided into the following four recovery units in order to assist in establishing recovery criteria and guiding recovery tasks: Sacramento Valley Unit, Mid-Valley Unit, San Joaquin Unit, and South Valley Unit (USFWS 1999). Both the Mid-Valley and San Joaquin units extend into the eastern edge of Contra Costa County.

The proposed project would permanently affect wetland habitat at West and East Kirker Creek, the unnamed drainage, and West Antioch Creek, areas that provide marginally suitable habitat for giant garter snake. Surveys for giant garter snake were conducted during the protocol surveys for California red-legged frog on May 6 and 7 and June 10 and 23, 2003, and no giant garter snakes were identified. There are currently no CNDDB records of the species within the project vicinity.

In its Biological Opinion for the SR 4 (East) Widening Project, USFWS states that the proposed State Route 4 project is not likely to adversely affect the giant garter snake "due to an apparent lack of suitable habitat" (USFWS, Biological Opinion – See Appendix F).

2.3.3.3 Impacts

The quality of wetland habitat for special status species in the vicinity of the SR 4 (East) Widening Project is extremely low and highly fragmented, and there were no historical records or studies to indicate that the California red-legged frog, giant garter snake, or western pond turtle occur within the project limits. Protocol-level surveys for California red-legged frog were conducted in May and June 2003. During the protocol-level surveys for California red-legged frog, surveys were conducted as well for giant garter snake and western pond turtle.

Caltrans submitted USFWS and CDFG copies of the NES / Biological Assessment (NES/BA) with a letter requesting their concurrence that the project is not likely to affect California red-legged frog, giant garter snake, or western pond turtle.

USFWS conducted a field review with Caltrans and CCTA staff on April 1, 2005, to determine the suitability of habitat for the California red-legged frog, salt marsh harvest mouse, and the giant garter snake. Based on this field review, USFWS determined that some areas at West Antioch Creek at the SR 4 / Contra-Loma Boulevard–L Street Interchange are suitable habitat for California red-legged frog. (No suitable habitat was identified for the giant garter snake.) Caltrans, in consultation with USFWS, determined the following areas of potential impact: Permanent impacts to aquatic habitat will be 0.15 acres, while permanent impacts to upland areas will be 1.42 acres. Temporary impacts to aquatic habitat will be 0.02 acres, while temporary impacts to upland areas will be 1.04 acres. Consultation history is provided in Chapter 3, Comments and Coordination. The Biological Opinion is included in this Environmental Document as Appendix G.

A letter was also sent to NOAA Fisheries on April 28, 2004, requesting their concurrence in the determination that there are no steelhead within waterways in the SR 4 project vicinity. NOAA Fisheries returned an affirmative reply to this finding on June 1, 2004. *A copy of the letter is in* Section 3.3, Correspondence.

2.3.3.4 Avoidance, Minimization and Compensation Measures

Permanent effects to the upland habitat for California red-legged frog will be compensated for at a 2:1 ratio (2.84 acres). Permanent effects to aquatic habitat will be compensated for at a 3:1 ratio (0.45 acres). To meet the compensation requirement, the Contra Costa Transportation Authority (CCTA) will make a contribution to the Muir Heritage Land Trust or other Service-approved conservation bank for the purchase of 2.84 acres of upland habitat and 0.45 acre of aquatic habitat, to be preserved in perpetuity for the California red-legged frog.

In addition, CCTA will restore 1.04 acres of upland habitat on site to compensate for temporary construction impacts to upland habitat within the buffer area. CCTA will prepare a draft proposal for the restoration, and Caltrans will review and submit the draft proposal to USFWS at least 60 calendar days prior to initial ground-breaking for the SR 4 (East) Widening Project for the project phase affecting Antioch Creek. The plan will include restoration and revegetation work associated with temporary effects using native California plant species from on-site or local sources (i.e., local ecotype). Plant materials from non-local sources will be allowed only with written authorization from USFWS. To the maximum extent practicable (i.e., presence of natural lands), topsoil will be removed, cached, and returned to the site according to successful restoration protocols. Loss of soil from run-off or erosion will be prevented with straw bales, straw wattles, or similar means, provided they do not entangle or block escape or dispersal routes of listed animal species. The draft and final plan will contain specific quantifiable criteria to evaluate the success of the restoration.

2.3.4 Invasive Species

2.3.4.1 Regulatory Setting

On February 3, 1999, President Clinton signed Executive Order 13112, which directs the agencies of the executive branch of the federal government to work to prevent and control the introduction and spread of invasive species. Species that are likely to harm the environment, human health, or the

economy are of particular concern. The executive order builds on the National Environmental Policy Act (NEPA) of 1969, the Federal Noxious Weed Act of 1974, and the Endangered Species Act of 1973 to prevent the introduction of invasive species; provide for their control; and take measures to minimize economic, ecological, and human health effects.

Invasive species, with respect to a particular ecosystem, are defined as any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to the ecosystem and is likely to cause economic or environmental harm or harm to human health.

Under the executive order, a federal agency cannot authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere unless all reasonable measures to minimize risk of harm have been analyzed and considered. Complying with the executive order means that federal-aid and Federal Lands Highway Program funds cannot be used for construction, revegetation, or landscaping that purposely includes the use of known invasive plant species.

The executive order established a National Invasive Species Council, and until an approved national list of invasive plants is defined by the council, "known invasive plants" are defined as those listed on the official noxious weed list of the state in which the activity occurs.

The following discussion complies with Executive Order 13112.

2.3.4.2 Affected Environment

The SR4 corridor from Loveridge Road to the eastern project limit consists of a four-lane freeway. The sides of the highway are covered by vegetation. A mixture of vacant land, residential, and commercial and light industrial businesses occupies the north and south sides of the highway within the proposed project limits. The majority of the properties to the immediate north are either vacant land or residential or light commercial properties. To the immediate south is mostly vacant land or residential properties. Along the interchanges to the south of the proposed project area are a few gasoline service stations, a used auto dealership, and a number of commercial storage facilities.

2.3.4.3 Impacts

The SR4 corridor provides opportunities for the movement of invasive species through the landscape. Invasive plant and animal species can move on vehicles and in the loads they carry. Weed seed can be inadvertently introduced into the corridor during construction on equipment and through the use of mulch, imported soil or gravel, or sod. Some invasive plant species might be deliberately or inadvertently planted in erosion control, landscape, or wildflower projects. The SR4 corridor is adjacent to a variety of private lands. Many of these adjacent lands have weed problems, and the highway rights-of-way provide corridors along which these noxious and exotic weeds can spread. As there are no adjacent waterways or local farms in this corridor, invasive animal species are not considered an adverse impact within the project area.

2.3.4.4 Avoidance, Minimization and Compensation Measures

To prevent or minimize any introduction or spread of invasive species in the project area, the following methods will be incorporated into the construction specifications:

- Using high pressure water blasting or steam cleaning methods, clean all earthmoving equipment of dirt, mud, and seed residue before initially entering the project area.
- Avoid any unnecessary disturbance of project areas known to be infested with noxious weeds.
- Minimize soil disturbance within right-of-way.
- If soil disturbance outside slope stake limits is necessary, keep disturbed area to a minimum, monitor and control disturbed areas and topsoil stockpiles for growth of weed species subject to control, and re-vegetate in accordance with the landscape plans or other project specifications when disturbance is no longer necessary.
- Control weeds with pre-emergent, selective and nonselective herbicides. Inspect and monitor erosion control and other disturbed soils throughout construction. Inspect and monitor landscaping/seeding during the vegetation re-establishment period.
- Include payment for equipment cleaning under bid item for mobilization.

Although there are no adjacent waterways or local farms in this corridor, to prevent or minimize any introduction or spread of invasive animal species in the project area, the construction specifications will require that the contractor adopt sanitation and exclusion methods for preventing spread of invasive species, such as the following:

- Restrict use of contaminated soils and fills,
- Require pest-free forage and mulch and weed-free sod,
- Wash construction equipment.

2.4 Construction Impacts

2.4.1 Construction Stages, Schedule, and Work Hours

In order to minimize disruption to the traveling public, it is anticipated that the SR 4 (East) Widening Project would be constructed in stages. The precise timing and limits of each construction stage may vary. The following paragraphs present feasible and reasonable construction sequencing for the purposes of identifying and evaluating construction phase impacts. This construction staging scenario would take from nine to ten years to complete.

2.4.1.1 Construction Stages

Project construction would be staged in four construction projects that would be built from west to east to minimize disruption of traffic. The anticipated limits of each construction stage are designated by the affected interchanges as follows:

1. Loveridge Road
2. Somersville Road through to G Street
   A. Somersville Road
   B. Contra-Loma Boulevard–L Street and G Street
3. Lone Tree Way–A Street
4. Hillcrest Avenue

It may be desirable to divide the second stage into two sub-projects as shown above.

Each of the construction stages would maintain two lanes of traffic on SR 4 in each direction throughout the construction period, except during critical short-term construction activities. Temporary night-time lane closures or detours would be required for activities such as placing and removing temporary concrete barriers to separate construction work areas and traffic. Temporary night closures of the SR 4 mainline would be required for safety reasons during demolition of existing structures and girder removal or placement, and during placement and removal of falsework for new structures. Some short-term closures of existing interchange ramps may be necessary during construction of conforms; traffic would be detoured to the adjacent interchanges for these periods. In order to maintain traffic on SR 4 and local streets, construction activities affecting traffic will not be permitted at more than one interchange or crossing of SR 4 at a given time.

In order to maintain traffic during structure replacement, typically, a portion of the structure is built and traffic detoured to that newly constructed portion while the rest of the structure is demolished and rebuilt. This approach would be used to maintain traffic during construction of the structures along SR 4.

Retaining walls would be constructed with the associated widening work in each stage and noise walls would be constructed as early in each stage as practicable to help mitigate construction noise. At some locations, noise walls would be located on top of retaining walls and could not be constructed until after the retaining wall was constructed.

The following subsections describe a possible construction sequence for the major construction activities of each construction stage.

Loveridge Road Interchange

A preliminary construction sequence for construction of the SR 4 / Loveridge Road Interchange is shown in Table 2.4.1-1. It is anticipated that construction of the new interchange and related improvements would take approximately two years. Most of the work would be done during daylight hours.

Table 2.4.1-1: STAGE 1: Possible Construction Activity Sequence and Traffic Handling for the Loveridge Road Interchange

Construction Activity Sequence	Traffic Handling
• Construct new pumping plant and storage box with temporary connection to existing inlets.	
• Remove existing pumping plant and construct new southbound Loveridge Road bridge.	• Shift traffic to existing outside shoulders and use reduced lane widths during new structure bent construction in median.
• Construct relocated North Park Boulevard and provide temporary connection to Loveridge Road.	
• Relocate eastbound off-ramp and eastbound loop on-ramp termini to the south and provide a temporary signal at the intersection with Loveridge Road.	• Short-term temporary ramp closures required.
• Widen westbound California Avenue on the north side.	• Maintain traffic on existing California Avenue.
• Construct approaches to new southbound bridge on Loveridge Road.	
• Construct California Avenue south side improvements and match raised Loveridge Road profile on south side.	• Shift traffic to north side of California Avenue.
• Construct temporary conform from North Park Boulevard to northbound Loveridge Road.	
• Remove the existing Loveridge Road and railroad bridges.	• Terminate rail traffic on Stoneman spur. • Shift Loveridge Road traffic to new southbound bridge and provide two lanes in each direction.
• Construct non-interfering portions of south approach to new northbound bridge on Loveridge Road.	• Close existing eastbound slip on-ramp and detour all traffic destined for eastbound SR 4 to existing eastbound loop on-ramp.
• Construct non-interfering portions of new eastbound off- and on-ramps.	
• Construct new northbound bridge and remaining portions of northbound approaches.	• Maintain two-way Loveridge Road traffic on southbound bridge.

Table 2.4.1-1: STAGE 1: Possible Construction Activity Sequence and Traffic Handling for the Loveridge Road Interchange

Construction Activity Sequence	Traffic Handling
• Complete north side of California Avenue and North Park Boulevard.	• Open Loveridge Road, California Avenue and North Park Boulevard fully to traffic.
• Construct non-interfering portions of new westbound ramps.	
• Construct non-interfering portions of SR 4 outside lanes, and complete ramp connections to SR 4 and termini at Loveridge Road / California Avenue.	• Short-term temporary ramp closures required.
• Construct new SR 4 inside lanes and median.	• Move SR 4 traffic to new outside lanes and open new ramps.
• Construct median barrier.	• All SR 4 lanes fully completed and opened to traffic.

Source: Parsons, 2003.

Rail service across SR 4 at Loveridge Road would be eliminated. The existing Camp Stoneman railroad underpass would be removed and the track terminated on the north side of SR 4. It is anticipated that motor vehicle traffic would be detoured onto the existing Loveridge Road ramps during these events.

Some short-term closures of the existing Loveridge ramps may be necessary during construction of conforms. Traffic would be detoured to the Railroad Avenue and Somersville Road interchanges for these periods.

Somersville Road to G Street

Stage 2 would include the Somersville Road and Contra Loma Boulevard–L Street Interchanges, and G Street overcrossing. This stage may be split into two pieces: Somersville Road, and Contra Loma Boulevard–L Street and G Street Overcrossing. Possible construction activity sequences for the SR 4 / Somersville Road Interchange and for the SR 4 / Contra Loma Boulevard–L Street Interchange and G Street Overcrossing are shown in Table 2.4.1-2 and Table 2.4.1-3 respectively. It is anticipated that construction of the new interchanges and related improvements would take approximately three years if constructed as one project, and two years for each interchange and related improvements if constructed as two separate projects. Most of the work would be done during daylight hours.

To accommodate the planned improvements to Somersville Road and Contra Loma Boulevard–L Street, longer and deeper structures carrying SR 4 are required. To provide adequate vertical clearance at these locations, the profile grade of SR 4 would be raised approximately two meters (six feet) at these two locations. This work would require partial construction of roadways and structures and detouring traffic from existing roadways to the newly constructed portions until the entire roadway and structures were completed.

The Somersville Road interchange would be constructed first. A possible construction activity sequence would be to partially construct the mainline and structures to the north, shift traffic, and complete the remainder of new westbound roadway and ramps. Temporary closures of westbound ramps would be required to construct new ramps and conforms. The eastbound SR 4 mainline and ramps would be constructed in a similar fashion, starting in the median area and working to the southern edge of the proposed roadway, ramp, and structure improvements. Ramp closures in the northeast and southeast quadrants would require temporary detours to the adjacent interchanges.

As part of the Somersville Interchange work, the SR 4 / Century Boulevard structure would be replaced and Century Boulevard would be closed to traffic during the structure construction due to inadequate vertical falsework clearance; traffic would be detoured to Loveridge and Somersville Roads during the closure period.

The G Street Overcrossing would likely be constructed next, followed by the Contra Loma Boulevard–L Street Interchange. The SR 4 mainline at G Street would be depressed 0.6 meters (two feet) and G Street raised approximately two meters (six feet) to provide adequate vertical clearance over the mainline and to comply with Americans with Disabilities Act (ADA) requirements on the profile of the G Street bridge approaches. A possible construction sequence would be to permanently close the G Street ramps, close and remove the existing structure, and reconstruct the structure. The G Street approaches would be constructed while maintaining traffic. There would be only short duration closures of Fitzuren Road, which has to be raised to tie in to the realigned G Street. Short duration closures may also be required to construct conforms at the intersections with Minta Lane, West Tregallas Road, and Drake Street. Once the G Street structure was completed, SR 4 mainline could be reconstructed and widened. The City of Antioch would prefer that G Street remain open during construction; investigations are underway to determine if there is a feasible method of keeping G Street open to traffic by phasing the construction differently while minimizing impacts. The staging scenario presented herein was evaluated because it represents a worst case for impacts assessment.

Construction of the Contra Loma Boulevard–L Street Interchange and SR 4 mainline work would follow the completion of work at G Street. New ramps at the interchange would be constructed first, along with some of the improvements to Contra Loma Boulevard–L Street. Widening of SR 4 would follow and generally proceed from the south side of the roadway to the north side in phases, shifting traffic to the newly constructed portions of the roadway in order to maintain traffic. Widening Contra Loma Boulevard–L Street under the new structure would be one of the last orders of work.

Table 2.4.1-2: STAGE 2A: Possible Construction Activity Sequence and Traffic Handling for the Somersville Road Interchange

Construction Activity Sequence	Traffic Handling
• Construct portion of westbound on-ramp between Somersville Road and existing westbound on-ramp, and provide a temporary connection to existing on-ramp.	
• Construct temporary connection from existing westbound off-ramp to existing westbound on-ramp.	• Shift westbound on-ramp traffic to newly constructed portion of ramp and temporary connection. Short-term temporary ramp closure required.
• Construct portion of new westbound off-ramp that does not conflict with existing ramps and portion of westbound SR 4 mainline approach.	• Shift westbound off-ramp traffic to new connection and former westbound on-ramp. Some short-term temporary ramp closures required.
• Construct remaining portions of westbound on-ramp.	• Short-term westbound on-ramp closure required to complete ramp where existing and proposed ramps cross. Once completed, shift westbound off-ramp traffic to newly constructed ramp, take existing off-ramp out of service.
• Construct remaining portion of westbound off-ramp at terminal with Somersville Road.	• Shift traffic to new westbound on-ramp. Short-term ramp closure required.
• Build the outside portion of the westbound SR 4 mainline, including portions of new structures at Somersville Road and Century Boulevard.	• Fully open westbound off-ramp to traffic. • Before construction starts on the SR 4 structure at Century Boulevard, Century Boulevard would be closed for the duration of bridge replacement activities due to insufficient vertical clearance during construction.
• Construct remainder of westbound mainline and median portion of roadway and Somersville Road and Century Boulevard structures except median barrier.	• Shift westbound mainline traffic to newly constructed portion of westbound mainline.
• Construct new eastbound on-ramp.	• Shift eastbound mainline traffic to portion of newly constructed median and portion of westbound facility. Short-term eastbound on-ramp closure required to construct overlapping portions of existing and proposed ramps. Traffic would be detoured along parallel arterials to adjacent interchanges.
• Remove existing slip off-ramp near terminus with SR 4, • Construct temporary connection from eastbound loop off-ramp to existing eastbound on-ramp alignment and modify terminus with Somerville Road to accommodate eastbound off-ramp traffic. • Construct new eastbound loop off-ramp and southern portion of SR 4 mainline.	• Open new eastbound off-ramp. • Open modified eastbound loop off-ramp to traffic. • Close eastbound slip off-ramp to construct new eastbound exit ramp.
• Close and remove existing eastbound loop off-ramp and complete new eastbound loop off-ramp. • Complete eastbound mainline roadway and Somersville Road and Century Boulevard construction.	• Close existing eastbound loop off-ramp.

Table 2.4.1-2: STAGE 2A: Possible Construction Activity Sequence and Traffic Handling for the Somersville Road Interchange

Construction Activity Sequence	Traffic Handling
• Construct median barrier.	• Shift mainline SR 4 traffic to permanent location.
• Construct new northbound Somersville Road.	
• Construct Somersville Road median, turn pockets, and southbound roadway modifications.	• Shift northbound traffic to new northbound roadway.
	• Shift Somersville Road traffic to permanent location.

Source: Parsons, 2003.

Table 2.4.1-3: STAGE 2B: Possible Construction Activity Sequence and Traffic Handling for the Contra Loma Boulevard–L Street Interchange and G Street Overcrossing

Construction Activity Sequence	Traffic Handling
• Close and remove the existing G Street structure. Construct the new structure and approaches. Raise grades on approaches using paving lifts and temporary pavement delineation to maintain traffic.	• Close G Street ramps and maintain traffic on G Street bridge approaches by adding paving lifts to raise grade. Improvements to G Street would be complete before moving forward with work at Contra Loma Boulevard–L Street interchange.
• Construct the new Contra Loma Boulevard–L Street Interchange ramps and widen SR 4 mainline along the outsides to connect ramps, provide temporary ramp connections to existing SR 4 as needed. Construct a portion of the Contra Loma Boulevard–L Street improvements as necessary to assist in interim function of street and ramp intersections. Construct realigned Claudia Court.	
• Construct SR 4 eastbound mainline improvements along south side of SR 4 and construct corresponding portion of the new Contra Loma Boulevard –L Street structure.	• Open new Contra Loma Boulevard–L Street ramps and realigned Claudia Court. Maintain two lanes of traffic on Contra Loma Boulevard–L Street.
• Construct remainder of SR 4 eastbound mainline and median and structure.	• Shift eastbound traffic to newly constructed lanes to the south.
• Construct remainder of westbound SR 4 mainline and structure.	• Shift westbound traffic to newly constructed eastbound roadway.
• Construct SR 4 median barrier.	• Shift SR 4 traffic to permanent location.
• Construct new southbound Contra Loma Boulevard –L Street.	
• Construct Contra Loma Boulevard–L Street median, turn pockets, and northbound roadway modifications.	• Shift northbound traffic to new southbound roadway.
	• Shift Contra Loma Boulevard–L Street traffic to permanent location.

Source: Parsons, 2003.

Lone Tree Way – A Street

Stage 3 would include the Lone Tree Way–A Street Interchange, Roosevelt Pedestrian Undercrossing and Cavallo Road Undercrossing. A preliminary construction sequence is shown in Table 2.4.1-4. It is anticipated that construction of the new interchange and related improvements would take approximately two years. Most of the work would be done during daylight hours.

At the Lone Tree Way–A Street Interchange, a possible construction sequence would be to construct the tie-back walls under the mainline structures, widen the bridges, and construct local street modifications in the northeast and northwest quadrants of the interchange. Then all the ramps, except the loop on-ramp, would be constructed and opened to traffic. Finally, the old westbound off-ramp would be taken out of service and the loop on-ramp built. No detours would be needed. Lone Tree Way–A Street could be widened as soon as the structure work is completed.

The Roosevelt Pedestrian Undercrossing needs to be constructed concurrent with the Lone Tree Way–A Street interchange ramps to and from the east. Construction timing may be dependent upon whether the pedestrian undercrossing will remain open or be permanently closed as there may be advantages to constructing it at a specific time to provide for pedestrian and bicycle access during the construction of improvements at the interchange and Cavallo Road, as discussed below. For safety reasons, the undercrossing would need to be closed for three months during the proposed project, but the City of Antioch has other safety concerns about the undercrossing and is considering closing it permanently.

The work at Cavallo Road would need to be constructed either before or after, but not concurrent with the Lone Tree Way–A Street interchange. Work would involve widening the SR 4 structures, and lowering Cavallo Road and reconstructing pedestrian facilities to comply with vertical clearance and ADA requirements. The City of Antioch has requested that the road remain open during construction. Techniques for structure widening are being investigated that would allow the structure widening work to be constructed and then lowered into place. If this is not feasible, the road would need to be closed for the duration of the structure widening work. Because the profile must be lowered to provide added vertical clearance, one direction of the roadway would be anticipated to be constructed at a time and one-way traffic control used to maintain traffic during construction.

Closure of the Cavallo Road undercrossing to pedestrian traffic during the ten-month construction period is recommended for pedestrian safety. Because closure of both the Roosevelt pedestrian undercrossing and Cavallo Road undercrossing at the same time is not desirable, construction activities can be specified to ensure that at least one of these pedestrian routes is available for use by pedestrians at all times throughout the construction period.

Table 2.4.1-4: STAGE 3: Possible Construction Activity Sequence and Traffic Handling for the Lone Tree Way–A Street Interchange

Construction Activity Sequence	Traffic Handling
• Construct Sunset Drive, Bryan Avenue, Drake Street modifications.	• Close portions of local streets to traffic as modifications are constructed.
• Construct new off- and slip on-ramps with temporary connections to mainline. Widen Roosevelt Pedestrian Underpass (or abandon and widen SR 4 mainline.)	•
• Begin SR 4 / Lone Tree Way–A Street structure work: construct tie-back walls, and widen structure to north and in median. Construct westbound ramp conforms at SR 4 mainline.	• Close and obliterate westbound old off- and on-ramps, and shift traffic to new ramps. • Close ramps temporarily to construct conforms.
• Construct new westbound loop on-ramp	• Close ramp temporarily to construct conform.
• Construct Lone Tree Way–A Street improvements.	• Some lane closures on Lone Tree Way–A Street would be required.
• Widen mainline to north and begin widening structure at Cavallo Road to north. Begin construction of Cavallo Road and associated pedestrian facilities modifications for one direction of travel.	• Open loop on-ramp to traffic and eliminate northbound left-turn onto westbound slip on-ramp. • Begin one-way traffic control on Cavallo Road.
• Widen mainline and structure at Cavallo Road in median.	• Shift traffic to new westbound lanes on north side of SR 4.
• Construct Cavallo Road and associated pedestrian facilities modifications for other direction of travel.	• Change one-way traffic control on Cavallo Road to opposing direction.
• Widen eastbound mainline and structures at Lone Tree Way–A Street and Cavallo Road to south. Construct eastbound ramp conforms at SR 4 mainline.	• Shift eastbound SR 4 traffic to the north on newly constructed mainline. • Close ramps temporarily to construct conforms.
• Construct median barrier.	• Shift SR 4 traffic to permanent location and re-open Cavallo Road to two-way traffic.

Source: Parsons, 2003.

Hillcrest Avenue

Stage 4 would reconstruct the Hillcrest Avenue Interchange and widen SR 4. A preliminary construction sequence is shown in Table 2.4.1-5. It is anticipated that construction of the new interchange and related improvements would take approximately two years. Most of the work would be done during daylight hours.

A possible construction scenario would be to build the western half of the new southbound structure first, followed by the removal of the existing southbound Hillcrest Avenue structure and construction of the remainder of the new southbound structure. Construction of the westbound off-ramp would be next, which would allow the old westbound off-ramp to be taken out of service, followed by the construction of the loop and dog-leg on-ramp in the northeast quadrant. Then the westbound on-ramp could be rebuilt. The eastbound off- and on-ramps may require some short-term temporary closures

for widening and repaving. The SR 4 mainline widening could be done to the outside and inside more or less simultaneously or one side of the mainline could be widened at a time in the scenario shown in Table 2.4.1-5.

Table 2.4.1-5: STAGE 4: Possible Construction Activity Sequence and Traffic Handling for the Hillcrest Avenue Interchange

Construction Sequence	Traffic Handling
• Construct new westbound slip off-ramp, and widen eastbound ramps. Construct western half of new southbound Hillcrest structure and approaches.	
• Demolish existing southbound Hillcrest Avenue structure and construct eastern half of new southbound Hillcrest Avenue structure and approaches.	• Shift southbound Hillcrest Avenue to new portion of Hillcrest Avenue structure.
• Construct westbound loop on-ramp with dog-leg, make modifications at Hillcrest Avenue / Sunset Drive intersection. Widen mainline to north and construct westbound ramp conforms.	• Close old westbound off-ramp and open new westbound off-ramp to traffic. • Close westbound ramps temporarily to construct conforms.
• Reconstruct westbound slip on-ramp.	• Open new westbound loop-on ramp with dog-leg and detour existing westbound slip on-ramp users to dog-leg entrance off of Sunset Drive. • Close existing westbound slip on-ramp.
• Construct SR 4 mainline improvements in median.	• Shift westbound mainline traffic to newly constructed westbound roadway to the north.
• Construct SR 4 mainline widening to south. Construct eastbound ramp conforms.	• Shift eastbound mainline traffic to newly constructed median areas to the north. • Close eastbound ramps temporarily to construct conforms.
• Construct median barrier.	• Shift mainline SR 4 traffic to permanent locations.

Source: Parsons, 2003.

2.4.1.2 Construction Schedule

Construction of the project would begin in 2007 with Stage 1: Loveridge Road Interchange. The anticipated start of construction for each stage is shown in Table 2.4.1-6 along with the anticipated construction duration. Sound walls would be constructed as part of the roadway project and as early as possible to provide construction noise mitigation. Each highway and interchange construction stage would be followed by a separate contract to provide replacement highway planting, with these contracts required to start within two years of the completion of the highway and interchange construction. The replacement planting contracts would require approximately six-month construction periods followed by a three-year plant establishment period; any lane closures required for this work would be made during non-peak travel periods.

Table 2.4.1-6: Stage Construction Schedule and Duration

Construction Stage	Begin Construction	Duration (years)
1. Loveridge Road	2007	2
2. Somersville Road / Contra Loma Boulevard–L Street / G Street [1]	2010	3[1]
3. Lone Tree Way – A Street	2013	2
4. Hillcrest Avenue	2015	2

[1] It is anticipated that construction of the new interchanges and related improvements would take approximately three years if constructed as one project and two years for each interchange and related improvements if constructed as two separate construction packages.

Source: Parsons, 2003.

2.4.1.3 Construction Hours

Most of the work would be done during daylight hours, but there would be some work in nighttime hours to permit temporary closures for tasks that could interfere with mainline traffic or create safety hazards. Examples of these tasks include placing and removing temporary construction barriers, erecting structure falsework over the mainline or an active cross street, demolishing existing structures, placing pre-cast bridge segments, or connecting or conforming to ramp termini to the mainline or local streets.

2.4.2 Traffic and Transportation/Pedestrian and Bicycle

The following subsections discuss traffic and access, detours, parking, pedestrian and bicycle issues by construction stage. General conditions outlined in the first stage would apply to later stages as well, while the specific subsections give particulars for the affected interchanges.

A Transportation Management Plan (TMP) for the project would be implemented for each construction stage and would include a public information program to provide motorists with advance notice of information related to the construction activities and durations, temporary closures and detours.

2.4.2.1 Stage 1: Loveridge Road Interchange

During the Stage 1 construction phase of the project, traffic in the vicinity of the Loveridge Road interchange or along the SR 4 mainline in the project area could be disrupted by construction equipment and vehicles. Table 2.4.1-1 lists steps in the traffic handling. In addition, some minor detours would be required on the ramps and connecting streets. There would be night closures of SR 4 to remove the railroad underpass and girders of the existing Loveridge Road Overcrossing, and to install and remove falsework. At such times traffic would be detoured onto the ramps. Traffic on SR 4 may also be affected by trucks hauling construction materials and debris. During construction of conforms of the new ramps to the mainline, which would most likely occur at night, traffic would be detoured to the adjacent interchanges.

The construction of a retaining wall adjacent to the Lakeview Apartments on East Leland Road in Pittsburg could temporarily affect covered parking containing about 89 spaces out of a total of about 256 parking spaces in the apartment complex. Section 2.4.2.5 discusses avoidance or mitigation of this impact. Construction activities for the project are not otherwise expected to have substantial impact on the availability of parking. Provisions would be incorporated into the construction contracts to designate areas for construction worker parking. Impacts to non-motorized traffic would be similar to those affecting motorized traffic. Bicycles and pedestrians are prohibited on the SR 4 right-of-way, but all detours of roadways that permit these modes of travel would include provisions for pedestrian and bicycle access during construction. Ramps meeting ADA requirements would be installed in sidewalks at all crosswalks affected by the project.

2.4.2.2 Stage 2: Somersville Road to G Street

Traffic conditions during construction would be similar to those described for Loveridge Road. Table 2.4.1-2 and Table 2.4.1-3 list steps in the traffic handling. At Somersville Road, there would be some short-term ramp closures in the northwest quadrant and longer term closures in the southeast quadrant of the interchange that would require detours to the adjacent interchanges. There would be temporary night closures of both Somersville Road and Contra Loma Boulevard–L Street to install and remove falsework, which may require detours to the adjacent crossings of SR 4.

At G Street, the existing ramps will be permanently closed. There would be night closures of SR 4 to remove the girders of the existing G Street Overcrossing, and to install and remove falsework. At such times all mainline traffic would be detoured to the eastbound or westbound roadway reduced to a single lane in each direction, or detoured onto the parallel arterials between Lone Tree Way–A Street and Somersville Road.

Pedestrian access would be maintained during construction. Ramps meeting ADA requirements would be installed in sidewalks at all crosswalks affected by the project.

2.4.2.3 Stage 3: Lone Tree Way–A Street

No mainline detours would be needed during the widening of SR 4 at the Lone Tree Way–A Street Interchange, but there would be temporary night closures of Lone Tree Way–A Street and Cavallo Road to install and remove falsework, which would require detours to parallel arterials between G Street and Hillcrest Avenue. Table 2.4.1-4 lists steps in the traffic handling.

Bicycle and pedestrian traffic would be temporarily affected by the closure of the Roosevelt Pedestrian undercrossing during construction for the safety of users. The City of Antioch is considering permanently closing the Roosevelt Pedestrian Undercrossing. With temporary or permanent closure of the Roosevelt Pedestrian Undercrossing, traffic would be re-routed to either Lone Tree Way–A Street or Cavallo Road.

Pedestrian access would be maintained during construction and a permanently designated pedestrian route signed that discourages pedestrian travel along the east side of Lone Tree Way–A Street between the east and westbound ramp terminals. Ramps meeting ADA requirements would be installed in sidewalks at all crosswalks affected by the project.

2.4.2.4 Stage 4: Hillcrest Avenue

At Hillcrest Avenue, there would be night closures of SR 4 to install and remove falsework. At such times traffic would be detoured onto the ramps. Table 2.4.1-5 lists steps in the traffic handling. After construction of the loop on-ramp in the northeast quadrant, the southbound traffic on Hillcrest Avenue and the eastbound traffic on Sunset Drive destined for the westbound slip on-ramp would be detoured via Sunset Drive to use the new loop ramp to permit reconstruction of the westbound slip on-ramp. The eastbound ramps would require short-term closures with traffic being detoured to the Lone Tree Way–A Street ramps.

Pedestrian access would be maintained during construction and a permanently designated pedestrian route signed that discourages pedestrian travel along the east side of Hillcrest Avenue between the east and westbound ramp terminals, and crossing Hillcrest Avenue on the south side of intersections with the eastbound ramp terminals and East Tregallas Road–Larkspur Drive. Ramps meeting ADA requirements would be installed at all crosswalks affected by the project.

2.4.2.5 Avoidance, Minimization, and Mitigation Measures

The following measures would be implemented to reduce traffic impacts during construction.

- Construction staging plans would be developed to minimize impacts to existing roadways.
- Contractors would be required to coordinate activities with commute schedules to minimize impacts to corridor traffic.
- *Construction activities would be coordinated with the local jurisdictions during the development of the Transportation Management Plan (TMP) and during the construction period.*
- Closure of one or more SR 4 mainline traffic lanes for construction activities would be limited to late night and weekend hours when traffic is at a minimum.
- Construction activity would be planned so that only one interchange in the project area would be under construction and affecting traffic at any one time.
- Construction crews would be required to follow established safety practices, including using flaggers, to protect work crews while working in the construction zone, and within an active railroad right-of-way.
- Provisions would be incorporated into the construction contracts to designate areas for construction worker parking to avoid parking impacts to residential or business areas.
- Construction haul routes would be required to utilize SR 4 during non-peak hours to the greatest extent practicable to avoid traffic impacts to residential or business areas.
- Techniques for constructing retaining walls will be investigated to avoid or minimize temporary impacts on adjacent parking at the Lakeview Apartments. Caltrans and CCTA would coordinate with the apartment owner to determine appropriate mitigation if an impact can not be avoided. Mitigation could include leasing apartment units to reduce parking demand or securing a construction easement to provide temporary parking on the adjacent vacant lot.

A TMP would be developed, in conjunction with the local jurisdictions, to provide advance notice to motorists and transportation and emergency service providers of information on construction activities and durations, detours, and access issues. The TMP would identify services to facilitate the safe implementation of the construction project such as increased California Highway Patrol presence during critical construction operations, and increased Freeway Service Patrol during peak travel periods. The TMP would also identify measures to address detours and other transportation issues.

2.4.3 Utilities/Emergency Services

It is anticipated that most utility relocation work would be performed in advance of the SR 4 widening work. Caltrans and CCTA would coordinate with all utility providers during the design phase of the project so that effective design treatments and construction procedures are incorporated to avoid adverse impacts to existing utilities *and traffic* during construction. Nonetheless, the potential exists for construction activities to encounter unexpected utilities within the area of roadway improvements. In addition, utility relocations may require short-term, limited interruptions of service. No interference to existing utility services is anticipated during the realignment of the overhead power transmission lines because PG&E would put customer loads on alternate lines until the connections are re-established.

If unexpected underground utilities are encountered, the construction contractor would coordinate with the utility provider to develop plans to address the utility conflict, protect the utility if needed, and limit service interruptions. Any short-term, limited service interruptions of known utilities would be scheduled well in advance and appropriate notification provided to users.

Caltrans and CCTA would also coordinate with emergency service providers and through the public information program to avoid emergency service delays by ensuring that all providers are aware well in advance of road closures or detours.

2.4.4 Visual/Aesthetics

All construction activities for the project would involve the use of a variety of construction equipment, stockpiling of soils and materials, and other visual signs of construction. While construction activity would be evident to corridor residents and employees/employers at businesses in the project area, these visual changes would be short-term and are a common and accepted feature of the urban environment. The construction contractor would be responsible to clear the work site of any trash or debris created by construction workers or activities and to maintain the site in an orderly manner. No substantial adverse impacts are anticipated, and therefore, no mitigation is necessary beyond Best Management Practices. Dust control during construction is discussed in Section 2.4.9, Air Quality.

2.4.5 Cultural Resources

As described in Section 2.1.8, Cultural Resources, a thorough and systematic level of effort has been conducted to establish the likelihood of encountering buried cultural resources during construction of the SR 4 (East) Widening Project. Based on the information collected during field surveys, documentary research, and subsurface testing, it is not anticipated that construction activities would

encounter or disturb cultural resources. In the unlikely event that previously unidentified cultural materials are unearthed during construction, Caltrans and FHWA would comply with 36 CFR 800.13 regarding late discoveries.

No historic structures would be disturbed during construction activities.

2.4.6 Hydrology

The SR 4 (East) Widening Project crosses numerous streams and channels, including Kirker Creek (East and West), Markley Creek, Antioch Creek (East and West), and the Los Medanos Wasteway. Construction would involve lengthening and addition of culverts within these various streams (some of which are ephemeral and some of which exhibit year-long flows). These construction activities can have deleterious effects on the surrounding watershed if construction controls are not in place. This section summarizes the potential impacts and avoidance and minimization measures proposed to prevent or reduce such impacts to surface waters during construction.

2.4.6.1 Impacts

Construction associated with waterway crossings could cause temporary changes in water volume or flow and increased siltation, sedimentation, erosion and water turbidity from bank-side activities and construction access. This project would disturb more than one acre of land, requiring a Stormwater Pollution Prevention Plan (SWPPP) to be prepared and implemented, in accordance with Section 402 of the federal Clean Water Act, as amended. One purpose of the SWPPP is to identify areas of concern related to construction within or close to major waterways. As part of the requirements for the SWPPP, temporary best management practices (BMPs) would be identified to be used during construction to minimize the effect of construction activities on waterways. These include BMPs designed to control streambank erosion and in-stream sedimentation, guidelines for stream crossings, and seasonal construction scheduling.

2.4.6.2 Mitigation

A SWPPP will be prepared and will identify construction-period BMPs to reduce impacts to surface waterways. Recommended construction-phase BMPs are the following:

- Schedule construction during the non-rainy season.
- Monitor the forecast for rainfall; adjust the construction schedule to allow implementation of soil stabilization and sediment treatment controls before the onset of rain.
- For stream crossings, minimize disturbance by selecting the narrowest crossing, avoid steep and unstable banks or highly erodible soils, select equipment that reduces the amount of pressure exerted on the ground (e.g. use wide or high flotation tires, dual tires, tracked machines, etc) and use overhead or aerial access for transporting equipment across streams whenever possible.
- Limit temporary stream crossings to culverts or bridges if the stream crossing remains during the rainy season.
- For pumped diversion of in-stream flows, continuously monitor pumps and incorporate a standby pump. Employ velocity dissipation at the outlet as necessary to control erosion.

- Size diversion channels and/or culverts to accommodate a minimum 10-year storm event if placed within the channel during the rainy season.
- Isolate work areas within the waterway from the flow using sheet piling, k-rails, rip rap berms, or other methods of isolation.
- Keep equipment used in a waterway leak-free.
- Stabilize waterway embankments where necessary using rock slope protection, netting, erosion control blankets, gravel bag berms, fiber rolls, etc.
- Protect all drainage systems (culvert entrances, inlets, etc) from debris and sediment laden waters.
- If in-channel disturbance of fines (sand and silt sized particles) occurs, wash the fines (using water from a water truck or hydrant) back into the interstitial spaces of the existing gravel and cobbles.

2.4.7 Water Quality

The SR 4 (East) Widening project will involve construction over streams and channels including Kirker Creek (East and West), Markely Creek, Antioch Creek (East and West), and the Los Medanos Wasteway. Construction will involve demolition of structures, cut and fill earthwork, asphalt paving, lengthening of culverts, bridge construction, retaining wall construction, site clearing, and landscaping. Each of these construction activities can have deleterious effects on the surrounding watershed and streams if storm water and non-storm water pollution controls are not in place during the time of construction. This section summarizes the potential impacts and measures proposed to avoid or minimize impacts to the surrounding watershed and surface waters during construction.

2.4.7.1 Impacts

Construction over or along waterways could cause streambank erosion and water turbidity from bank-side activities and construction access as well as increased siltation, and sedimentation from temporary changes in water flow. The SR 4 project will require a SWPPP to be prepared and implemented, as described in the previous section. Another objective purpose of the SWPPP would be to reduce the amount of construction-related pollutants that are transported from construction activities or by stormwater runoff to surface waters. As part of the requirements for the SWPPP, temporary storm water pollution prevention practices will be identified to be used during construction. The SWPPP will detail the placement, staging, and monitoring of best management practices (BMPs) required to be implemented during project construction. These include BMPs designed to control discharges of pollutants from regulated construction projects, including pollutants from stormwater and non-stormwater discharges.

2.4.7.2 Mitigation

A SWPPP will be required to be prepared by the contractor to identify construction-period BMPs to reduce water quality impacts. The SWPPP will emphasize: 1) standard temporary erosion control measures to reduce sedimentation and turbidity of surface runoff from disturbed areas, 2) personnel

training, 3) scheduling and implementation of BMPs throughout the various construction phases and during various seasons, 4) identification of BMPs for non-storm water discharge such as fuel spills, and 5) mitigation and monitoring throughout the construction period. The plan will be submitted to Caltrans and the Regional Water Quality Control Boards. Construction over and adjacent to waterways will include special construction BMPs to minimize debris deposition into those waterways. Suggested BMPs for such activities are:

- Demolition and construction over and adjacent to waterways would be accomplished using non-shattering methods that would scatter debris (that is, wrecking balls will not be acceptable).
- Place platforms under/ adjacent to bridges over waterways to collect debris.
- Provide watertight curbs or toe-boards on bridges over waterways to contain spills and prevent materials, tools and debris from falling from the bridge.
- Secure materials adjacent to waterways to prevent discharges via wind.
- Use attachments on equipment such as backhoes to catch debris from small demolition operations.
- Stockpile accumulated debris and waste generated from demolition away from the waterway.
- Work areas within the waterway are to be isolated from the flow using sheet piling, k-rails, rip rap berms or other methods of isolation.
- Use drip pans during equipment operation, maintenance, cleaning, fueling and storage for spill prevention. Place drip pans under all vehicles and equipment placed on a bridge when expected to be idle for more than 1 hour.
- Keep equipment used in a waterway leak-free.
- Stabilize waterway embankments where necessary using rock slope protection, netting, erosion control blankets, gravel bag berms, fiber rolls, etc.
- Protect all drainage systems (culvert entrances, inlets, etc) from debris and sediment laden waters.
- Keep logs of all storm events and spill events.

In the event groundwater is encountered during construction, dewatering would be conducted locally. Dewatering effluent would be tested for contaminants as specified by the Regional Water Quality Control Boards. Contaminated effluent would be disposed of in accordance with applicable federal, state and local regulations.

It is anticipated that the project will require a Water Quality Certification from the Regional Water Quality Control Board in accordance with Section 401 of the Clean Water Act. This permit may stipulate additional waste discharge requirements and management practices to be implemented during construction.

2.4.8 Hazardous Waste

2.4.8.1 Impacts

The potential exists for the release of hazardous materials that are used for construction operations and for the release of lead and asbestos during construction due to the disturbance of the adjacent soil and demolition of structures.

2.4.8.2 Avoidance, Minimization, and Compensation Measures

An approved worker health and safety plan (WH&SP) would address any hazardous materials handling during construction activities pursuant to Title 8 of the California Code of Regulations regarding workers' safety and the use of protective equipment during excavation, moving, or handling of contaminated soil or water. The WH&SP would address storage and disposal of any hazardous/materials used in construction operations. Since construction workers are in the closest proximity to potential hazards, a plan that avoids impacts to construction workers would provide adequate protection for surrounding residents, workers, and the traveling public.

For ADL and ACM, mitigation would be conducted as described in Section 2.2.4.4.

In the event groundwater is encountered during construction, mitigation will be conducted as described in Section 2.4.7, Water Quality, to prevent contamination from hazardous wastes. In the event contaminated groundwater is encountered, it will be handled as described in Section 2.2.4.4.

2.4.9 Air Quality

2.4.9.1 Impacts

Construction of the Build Alternative would occur over an approximately 10-year period from 2007 to 2017 and in four construction stages:

1. Loveridge Road Interchange
2. Somersville Road to Contra Loma Boulevard – L Street;
3. Lone Tree Way – A Street to Cavallo Road; and
4. Hillcrest Avenue Interchange

Construction at each stage would generate pollutant emissions from the following construction activities:

1. Clearing and grubbing;
2. Grading and excavation;
3. Mobile emissions related to construction worker travel to and from project sites;
4. Mobile emissions related to the delivery and hauling of construction supplies and debris to and from project sites; and
5. Fuel combustion by on-site construction equipment.

Among the four stages, construction from Somersville Road to Contra Loma Boulevard – L Street would last the longest (approximately three years if constructed as a single, combined package or four years if each interchange were constructed separately). This stage also would require the most earthwork, material, and hours of construction equipment operation. Thus, worst-case daily construction emissions were calculated based on this second stage. The other stages of construction would result in lesser amounts of average daily pollutant emissions. Table 2.4.9-1 shows the estimated emissions associated with each component of the worst-case second stage phase of construction.

BAAQMD's approach to CEQA analysis of construction impacts is to emphasize the implementation of effective and comprehensive control measures. BAAQMD's recommended approach to mitigating construction emissions focuses on a consideration of whether all feasible control measures are being implemented. The *BAAQMD CEQA Guidelines* provide feasible control measures for construction emissions. If the appropriate construction controls are implemented, air pollutant emissions for construction activities would be considered less than significant.

Table 2.4.9-1: Construction Emissions

Construction Phase	CO	ROG	NO_X	SO_X	PM_{10} (Without Mitigation)	PM_{10} (With Mitigation)
Clearing & Grubbing	67	13	130	11	102	51
Earthwork	91	20	191	18	107	54
Structures	183	36	437	41	122	63
Retaining Walls & Soundwalls	137	34	298	27	112	57
Paving	58	11	147	13	103	52
Finishing	25	8	78	7	100	50
Maximum	183	36	437	41	122	63

Source: Terry A. Hayes Associates LLC, 2004.

2.4.9.2 Avoidance, Minimization, and Compensation Measures

- All active construction areas shall be watered at least twice daily.
- All trucks hauling soil, sand, and other loose materials shall be covered and shall maintain at least two feet of freeboard.
- All unpaved access roads, parking areas, and staging areas at the construction site shall be watered at least three times daily or shall be applied with non-toxic soil stabilizers.
- All paved access roads, parking areas, and staging areas at the construction site shall be swept daily with water sweepers.
- Streets shall be swept daily with water sweepers if visible soil material is carried onto adjacent public streets.

- Non-toxic soil stabilizers shall be applied to inactive construction areas (previously graded areas that are inactive for ten days or more).
- Exposed stockpiles of dirt, sand, or debris shall be enclosed, covered, watered at least twice daily, or applied with non-toxic soil binders.
- Traffic speeds on unpaved roads shall be limited to 15 miles per hour.
- Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways.
- Operations on any unpaved surfaces shall be suspended during "Spare the Air" days.
- Vegetation in disturbed areas shall be replanted as quickly as possible.
- Tires or tracks of all trucks and equipment leaving the site shall be washed.
- Excavation and grading activities shall be suspended when winds exceed 25 miles per hour.

Implementation of these measures would ensure that construction-phase air quality impacts are less than significant.

2.4.10 Noise

Noise at the construction sites would be intermittent and the intensity of it would vary. The degree of construction noise may vary for different areas of the project site and also vary depending on construction activities.

2.4.10.1 Regulatory Setting

During the construction period, the contractors would be required to comply with the noise ordinances of the cities of Pittsburg and Antioch:

City of Pittsburg	Construction activities between the hours of 10 p.m. and 7 a.m. are prohibited (Noise Ordinance, Pittsburg, 1974).
City of Antioch	Construction activity is prohibited on weekdays prior to 7 a.m. and after 6 p.m. In addition, construction activity is prohibited prior to 8 a.m. and after 5 p.m. within 300 feet of an occupied dwelling. Weekend construction activity is prohibited prior to 9 a.m. and after 5 p.m. (Noise Ordinance, Antioch, 2003).

2.4.10.2 Impacts

Long-duration construction noise exposures are difficult to quantify due to the intermittent nature of construction noise. Highway construction is accomplished in several different phases. Table 2.4.10-1 lists the calculated noise level for typical construction activity that could be expected in the project area.

Table 2.4.10-1: Construction Operation Noise Levels

No. of Items	Equipment Type	Maximum Equipment Noise Level at 15 m, dBA	Hourly Equivalent Noise Levels at 15 m, dBA [1]	Hourly Equivalent Noise Levels at 30 m, dBA [1]
Clear and Grub				
1	Excavator	83	80	74
1	Backhoe	75	72	66
4	Heavy Duty Dump Trucks	77	74	68
		Overall $L_{eq}(h)$	84	78
Bridge Demolition				
1	Backhoe	75	72	66
1	Excavator	83	80	74
4	Heavy Duty Dump Trucks	82	79	73
		Overall $L_{eq}(h)$	87	81
Retaining Walls				
1	Backhoe	75	72	66
1	Bormag BMP 851	80	77	71
1	Concrete Pump	81	78	72
1	Compressor	68	65	59
3	Ready Mix Trucks	81	78	72
4	Medium Duty Dump Trucks	77	74	68
2	Flatbed Truck	75	72	66
		Overall $L_{eq}(h)$	87	81
Paving				
1	Grader	75	72	66
1	Water Truck	77	74	68
1	Vibratory Roller	78	75	69
1	Compactor	76	73	67
1	Concrete Pump	81	78	72
3	Ready Mix Trucks	81	78	72
1	Asphalt Paver	79	76	70
1	Asphalt Roller	78	75	69
1	Sweeper	79	76	70
4	Medium Duty Dump Trucks	77	74	68
2	Flatbed Truck	75	72	66
		Overall $L_{eq}(h)$	88	82
Earthwork				
1	Excavator	83	80	74
1	Backhoe	75	72	66
1	Front Loader	74	71	65
1	Dozer	85	82	76
1	Trencher	80	77	71
4	Heavy Duty Dump Trucks	77	74	68
		Overall $L_{eq}(h)$	87	81
Structures				
1	Excavator	83	80	74
1	Backhoe	75	72	66
1	Bormag BMP 851	80	77	71
1	Crane	85	82	76
1	Concrete Pump	81	78	72
1	Compressor	68	65	59
1	Bridge Deck Paver	77	74	68
2	Flatbed Truck	75	72	66
1	Pile Driver	80	77	71
4	Medium duty Dump Trucks	77	74	68
3	Ready Mix Trucks	81	78	72
		Overall $L_{eq}(h)$	89	83
Miscellaneous				
1	Loaders	74	71	65
1	Dozer	85	82	76
2	Medium duty Dump Trucks	77	74	68
		Overall $L_{eq}(h)$	84	78

Notes: Calculated construction noise levels assume that all equipment operates for six hours out of an eight-hour day. Calculations also assume that all equipment is operated at full load 70 % of the time.

1. Predicted noise levels are from the center of the construction activity.

Source: Parsons

2.4.10.3 Avoidance, Minimization, and Compensation Measures

The following control measures would be implemented to minimize noise disturbances at sensitive receptors during construction:

Equipment Noise Control

- Ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine enclosures, and engine vibration isolators intact and operational. All construction equipment would be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding, etc.) (Caltrans, 1999).
- Turn off idling equipment.

Administrative Measures

- Conduct all construction activity during the hours permitted according to the ordinances of the cities of Antioch and Pittsburg.
- Implement a construction noise monitoring program to limit the impacts.
- Plan noisier operations during times of least sensitivity for receptors.
- Keep noise levels relatively uniform and avoid impulsive noises.
- Maintain good public relations with the community to minimize objections to unavoidable construction noise. Provide frequent activity updates of all construction activities.

Application of the mitigation measures will reduce construction noise at the sensitive receptors; however, a temporary increase in noise would likely occur.

2.4.11 Biological Resources

2.4.11.1 Construction Phase Impacts

This section focuses on the short-term impacts of constructing the SR 4 (East) Widening project on biological resources in the project vicinity. Permanent impacts and mitigation measures are addressed in Section 2.3, Biological Environment. Potential effects and avoidance, minimization, and compensation measures discussed herein are based upon the Natural Environment Study and Wetlands Delineation Report prepared for the project.

Wetlands and Other Waters of the U.S.

The project has the potential to temporarily affect 0.0102 hectares (0.0251 acres) of jurisdictional wetlands and 0.0035 hectares (0.0086 acres) of other waters of the U.S.—or 0.0136 hectares (0.0337 acres) total wetlands/waters. Avoidance and minimization measures are proposed as described in the next section.

Special-Status Species

The project has the potential to temporarily affect 0.02 acres of aquatic habitat and 1.04 acres of upland habitat for the California red-legged frog.

No special-status plants were identified in the project vicinity during the field studies, and it is not anticipated that special-status plants would occur in the project vicinity at the time of construction. Nonetheless, pre-construction surveys are recommended for the three plant species for which potentially suitable habitat was observed to avoid harm to the species during construction.

2.4.11.2 Avoidance, Minimization and Compensation Measures

Construction phase impacts would be avoided or minimized by using Caltrans standard specifications and BMPs that have been established for construction of State highway facilities (Caltrans, 1995). Procedures are identified with respect to individual biological resource issues in the following paragraphs.

Wetlands and Other Waters of the U.S.

CCTA would modify the project specifications and special provisions to ensure the following stipulations:

- Construction within wetlands and drainages would be avoided during the rainy season to prevent excessive siltation and sedimentation;
- Materials and fluids generated by construction activities would be placed at least 30 meters (100 feet) from wetland areas or drainages until they could be disposed of in accordance with applicable regulations; and
- All natural communities and wetland areas located outside of the construction zone that could be affected by construction activities would be temporarily fenced off and designated as

Environmentally Sensitive Areas (ESAs) to prevent accidental intrusion by workers and equipment.

Wetland habitats that are temporarily lost or disturbed due to project construction would be restored on-site to pre-construction conditions. Revegetation would be with native species such as cattails (*Typha* spp.), *Juncus* spp., or *Cyperus* spp. Any revegetation would be carried out by a contractor qualified in habitat restoration.

Special-Status Species—Plants: Mason's Lilaeopsis, Eel-Grass Pondweed, and Blue Skullcap

- Pre-construction surveys would be conducted in appropriate areas throughout the area of disturbance for construction and within a 16.7-meter (50-foot) buffer around that area during the blooming period immediately prior to construction initiation for Mason's lilaeopsis, eel-grass pondweed, and blue skullcap, three species for which suitable habitat was identified within the project area. These surveys would be conducted to ensure no harm to these plants.
- If potential habitat areas for special-status plant species were identified adjacent to the construction zone during the pre-construction surveys, a minimum 10-meter (30-foot) buffer would be clearly delineated with mesh fence around the habitat for all sensitive plant resources. The mesh fence would remain in place for the duration of the construction work.
- In the event the pre-construction surveys were to identify special-status plants in the area of disturbance for the project, compensation measures to include transplantation and appropriate ratios, would be discussed with USFWS and CDFG, as appropriate.

Special-Status Species—Wildlife: California Red-legged Frog, Pond Turtle, and Giant Garter Snake

California Red-Legged Frog

Avoidance and compensation measures for California red-legged frog were established in consultation with USFWS as follows:

1. *The Contractor shall furnish a permitted Biological Monitor.*
2. *A general Biological Monitor may be used instead of the permitted Biological Monitor for on-site monitoring in certain instances as specified below.*
3. *The permitted Biological Monitor shall be on site during the installation of perimeter barriers (Type Frog) and temporary fence (Type ESA), and during any clearing and grubbing activities to ensure work areas are clear of listed species.*
4. *The general Biological Monitor shall conduct monitoring prior to the initiation of each construction work shift in active construction work areas at West Antioch Creek, routinely at the beginning of the work shift.*
5. *A Biological Monitor must be on-call and capable of responding to the work site within one hour.*

6. *Biological Monitors shall maintain monitoring records. All monitoring records shall be provided to the Resident Engineer upon completion of the monitoring work.*
7. *When any frog is encountered by a Biological Monitor or Contractor's personnel, construction activities in the immediate area (within a 15-meter radius) of where the frog is found shall be immediately halted. If encountered by the Contractor's personnel, the Resident Engineer and on-site Biological Monitor shall be immediately notified. If encountered by the Biological Monitor, the Resident Engineer and Contractor shall be immediately notified. If the permitted Biological Monitor is not present when a frog is encountered, the general Biological Monitor shall immediately notify the permitted Biological Monitor.*
8. *If the general Biological Monitor is not authorized by the USFWS to handle the California red-legged frog, any individual frog encountered on the project site shall be protected, at the location where encountered, underneath an inverted 5-gallon white plastic bucket until the permitted Biological Monitor arrives at the site to identify the specimen to species. The permitted Biological Monitor, in accordance with USFWS guidelines, shall move any live California red-legged frog encountered within the construction zone out of the construction zone. Injured or dead California red-legged frogs shall be handled only by the permitted Biological Monitor as prescribed in the USFWS permit.*
9. *In addition, any injured or dead California red-legged frogs found or any unanticipated damage to the species habitat occurring due to construction activities shall be reported immediately to the on-site Biological Monitor and the Resident Engineer. The Biological monitor shall notify USFWS within 24 hours and prepare a written report by the end of the work shift.*
10. *The permitted Biological Monitor shall conduct a pre-construction employee education program for Contractor and State personnel prior to the start of construction. All Contractor personnel working on the project shall attend the program.*
11. *California red-legged frog photo identification cards and information sheets shall be passed out to all workers.*

Other measures include the following:

1. *Restricting project-related vehicle traffic to established roads, construction areas, and other designated areas.*
2. *Establishing a litter-control program.*
3. *Storing grindings and asphaltic-concrete waste within previously disturbed areas absent of habitat and at a minimum of 150 feet from any culvert or stream.*
4. *Submitting to the USFWS, at least 60 calendar days prior to initial groundbreaking, a draft proposal for restoration of the 1.04 acres.*

5. *Cover and fill maintenance and construction excavations greater than two feet deep at the end of each working day.*
6. *Using tightly woven fiber netting (not plastic mono-filament netting) for erosion control.*

These and other avoidance and minimization measures are described in full in the USFWS Biological Opinion provided in Appendix G in this environmental document.

Giant Garter Snake

Surveys found no giant garter snake in the project area, and it is unlikely that giant garter snake is in the project vicinity. In addition, USFWS stated in its Biological Opinion that there is no suitable habitat for the giant garter snake in the project vicinity. (See Appendix G.)

Western Pond Turtle

Surveys found no western pond turtle in the project area. It is unlikely that western pond turtles are in the project vicinity. Nevertheless, preconstruction surveys shall be conducted for the western pond turtle. In addition, a qualified biological monitor shall survey the construction site each day of construction before construction activities begin for that day. If a pond turtle is identified at the site, the turtle shall be captured and relocated by an approved biologist.

2.5 Cumulative Impacts

NEPA defines cumulative impact as "the impact...which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions." CEQA defines cumulative impacts as "two or more individual effects which, when considered together are considerable," and suggests that cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time" (State CEQA Guidelines Section 15355). NEPA includes cumulative impacts within the scope of impacts to be considered in an environmental document.

CEQA documents are required to include a discussion of cumulative effects when those effects are significant, and the State CEQA Guidelines suggest two possible methods for assessing potential cumulative effects (State CEQA Guidelines Section 15130). The first method is a list based approach, which considers a list of past, present, and reasonably foreseeable future projects producing related or cumulative impacts. The second method is projections based, and uses a summary of projections contained in an adopted general plan or related planning document that is designed to evaluate regional or areawide conditions.

While the use of regional projections is one possible method of analyzing cumulative effects under CEQA, it is the required method under NEPA. FHWA guidelines require that regional growth projections from the metropolitan planning organization (ABAG and MTC in this case) be used as inputs for the assumed future year conditions.

The CCTA East County Model was used to develop the travel forecasts for development and growth in the region through the year 2030. The CCTA East County Model estimates future traffic and transit travel demand for the entire county, with additional detail for the East County area, based on

land use and employment forecasts prepared by the CCTA's Land Use Information System (LUIS). LUIS data used for this model were consistent with *Projections '98,* developed by the ABAG. Additionally, regional growth estimates from *Projections 2000* were used for population and land use in the remainder of the Bay Area region. The regional control totals incorporated the 2025 county-to-county trips by purpose tables from the MTC regional travel demand model, based on *Projections 2000.* Extrapolation from 2025 (the horizon year for *Projections '98* and *Projections 2000*) to 2030 was accomplished by factoring the final trip table by four percent to reflect overall growth in population and employment as predicted by ABAG's *Projections '98 Plus.* The CCTA East County Model used the 2025 East County roadway network as refined for the Brentwood General Plan Update (dated April 2001).

2.5.1 Regional Context

Because this document is based on accepted, regional land use forecasts for 2030, and assumes transportation improvements programmed within the same time frame, effects evaluated with the project include the cumulative effects of development within the region. Thus, additional analysis of cumulative effects related to specific development and transportation improvement projects within the region is not necessary for impacts such as land use, transportation (including traffic and transit), air quality, and noise.

2.5.2 Local Context

Cumulative effects are not always regional in scope, and the current project was analyzed to determine whether less than significant environmental effects that would be experienced locally could become significant when considered in combination with other reasonably foreseeable future projects in the project area. Reasonably foreseeable future projects are here defined as the projects assumed in the 2030 No-Build Alternative described in Chapter 1 and the other related projects described in Section 1.4, Related Projects.[1]

Impact issues considered in this context include impacts to biological resources, relocations, and visual quality. Also, traffic impacts during construction of the SR 4 (East) Widening project were considered for cumulative effects with other projects that would be under construction concurrently.

2.5.2.1 Biological Resources

The proposed project would affect 0.1910 hectares (ha) (0.472 acres) of jurisdictional wetlands and other waters of the U.S., including 0.1774 ha (0.4383 acres) of permanent loss and 0.0136 ha (0.0337 acres) of temporary (construction-phase) impacts, as described in Section 2.3.1, Wetlands and Other Waters of the United States. The habitat value of the affected wetlands are limited by their isolation, fragmentation, and lack of meaningful ecotones. No special-status species are present. It is

[1] Studies for relocation of the UPRR team track, being conducted by the City of Pittsburg in cooperation with the UPRR, have yet to begin, so there are no impacts to report at this time. It is understood that the new team track will be located within UPRR right-of-way and that no biological resource or visual impacts will result. It is anticipated that property owners whose freight deliveries will need to be made by truck will receive some form of monetary compensation. Air quality, noise, and traffic impact studies and the environmental document are expected to be completed over the next few months.

expected that the purchase of credits from an established mitigation bank or on-site/ in-kind mitigation at a mitigation ratio to ensure no net loss of wetlands, would be implemented as compensation for these impacts.

Table 2.5.2-1 shows the wetlands/waters impacts that would result from the related projects in the corridor.

The wetlands/waters affected by the SR 4 (East) Widening Project represent only a small percentage (seven percent) of the combined corridor-wide wetlands/waters impacts and would not render these impacts cumulatively considerable. The habitat values of the wetlands associated with the SR 4 (East) project are negligible.

Table 2.5.2-1: Impacts to Wetlands / Waters of the U.S. from Other Projects in the SR 4 Corridor

Project	Impacts to Wetlands and Other Waters of the U.S.
State Route 4 Flood Relief Project (Kirker Creek)	Net beneficial effect within the project limits
Route 4 East Widening Project (Willow Pass Road to Railroad Avenue)	0.09 ha (0.22 ac) of total affected wetland
Route 4 East Widening Project (Railroad Avenue to west of Loveridge Road)	No impact
State Route 4 Bypass Project	1.89 ha (4.68 ac) of seasonal wetlands and 0.42 ha (1.04 ac) of other waters
Total Wetlands/Waters Impacts	**1.98 ha (4.9 ac) of seasonal wetlands and 0.42 ha (1.04 ac) of other waters**

2.5.2.2 Displacements / Relocations

The various SR 4 improvement projects would require residential and business relocations as shown in Table 2.5.2-2.

Each of these projects would provide relocation assistance in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act, and none of the projects has identified a lack of relocation resources or the need for last resort housing. The SR 4 (East) Widening project also would provide relocation assistance in accordance with the Act and also does not anticipate a shortage of relocation resources. Because the present project's relocations would generally be separated in time from those of the related projects, and the related projects would also not conduct their relocations concurrently, these projects would not be in competition for relocation resources. It is anticipated that all displaced residents and businesses would be able to be relocated within the SR 4 corridor. These displacements would not accumulate to disproportionately affect any particular neighborhood or community, nor would they combine to affect neighborhood character or community cohesion within

the SR 4 corridor as a whole. Thus, no adverse cumulative displacement / relocation impacts are predicted.

Table 2.5.2-2: Displacement / Relocation Impacts of SR 4 (East) Widening and Related Projects

Project	Relocations Required		
	Residential Units	Businesses	Social or Religious Facilities
SR 4 (East) Widening Project: Loveridge Rd. to SR 160	44	20	0
SR 4/Loveridge Road Flood Relief Project (Kirker Creek)	0	0	0
Route 4 East Widening Project (Willow Pass Road to Railroad Avenue)	9	0	0
Route 4 East Widening Project (Railroad Avenue to west of Loveridge Road)	57	15	3
SR 4 Bypass Project[2]	4	2	0
Total	114	37	3

2.5.2.3 Visual Quality

The SR 4 (East) Widening project and all of the related SR 4 improvement projects would result in new roadway infrastructure including additional lanes and modified interchange facilities and would require noise barriers, widened overcrossing structures, and retained cuts. These projects would remove some existing mature highway vegetation, which would be replaced consistent with current highway planting guidelines. All of these elements would represent visual changes but these changes are generally consistent with the existing visual character of the roadway corridor.

To improve overall roadway aesthetics and achieve consistency in aesthetic design treatments among the various SR 4 projects, CCTA, in coordination with Caltrans, Contra Costa County, and the cities of Pittsburg and Antioch, has created the *Visual Design Guidelines, Route 4 East Corridor* (2003). One aspect of the guidelines is to incorporate visual elements of the natural landscape into consistent visual themes for the corridor. The guidelines also establish roadway landscaping goals. The SR 4 (East) Widening project and the other SR 4 improvement projects would conform to these guidelines, which would address any adverse visual impacts and enhance the overall visual quality of the corridor for motorists as well as residents and business owners and clients along SR 4. No adverse cumulative impact would result.

During construction, there would be temporary disruptions from demolitions, earthwork, staging of construction materials, removal of construction debris, and other construction activities. These would be limited in duration and area, with different locations being under construction at different times, and would be consistent with other types of construction projects that are a regular feature of the

[2] Information derived from 1993 environmental document, which is being updated by the State Route 4 Bypass Authority.

urban scene. Construction documents would require contractors to maintain the construction sites in accordance with best management practices. No adverse cumulative impact is anticipated.

2.5.2.4 Construction Phase Traffic Impacts

Long-term cumulative effects of the SR 4 improvement projects would be beneficial, relieving present congestion by providing more mixed-use and high occupancy vehicle lanes through the corridor. If, however, two or more projects in the same transportation corridor are under construction at the same time, excessive traffic delays and detours could occur during construction. As described in Section 2.4.1.2, construction of the proposed project would begin in 2007 at the Loveridge Road Interchange. SR 4 widening west of Loveridge Road will be completed before then and widening east of Loveridge would proceed later, so no cumulative traffic disruptions as a result of multiple widening projects along SR 4 would result. Likewise, the SR 4 Flood Relief Project is scheduled for completion in June 2004, which is three years before construction would begin for the SR 4 (East) Widening Project, so its construction activities would not add to those of the SR 4 (East) project. (Refer to Section 1.4.2, Related Projects, for more details on the scheduling of these projects.)

The SR 4 Bypass Project is currently under construction. Because the SR 4 Bypass is a new roadway, only the construction of its new interchange east of Hillcrest Avenue (Segment 1) has any potential to contribute to cumulative impacts traffic impacts with SR 4 (East). The first and primary phase of the interchange construction is scheduled to be completed in 2007, which is the year that construction of the SR 4 (East) project is scheduled to begin at the Loveridge Interchange. The remaining stages of the SR 4 (East) Widening Project are planned to begin in 2010, after the completion of the SR 4 Bypass. Thus, there is minimal potential for a cumulative increase in delay in the corridor. (Refer to Section 1.4.2. SR 4 Bypass Project for more information on the SR 4 Bypass.)

As described in Section 2.4.2.5, *Avoidance, Minimization, and Mitigation Measures*, construction of the SR 4 (East) Widening Project would be managed to minimize traffic impacts. Detours and delays would be coordinated with local authorities to minimize disruption for traffic and emergency services through the East County. The present project would therefore not contribute to adverse cumulative effects.

Permanent cumulative effects of SR 4 widening would be beneficial, as future travel demand and projected peak-hour traffic volumes would be better accommodated without spreading the peak period congestion throughout the day.