4.12 TRANSPORTATION AND CIRCULATION

4.12.1 INTRODUCTION

The Transportation and Circulation chapter of the EIR addresses the existing and cumulative transportation and circulation conditions associated with the development of the proposed project. The analysis includes consideration of automobile traffic impacts on roadway capacity, circulation, transit, and bicycle and pedestrian facilities.

Documents referenced to prepare this chapter include a Transportation Impact Assessment (TIA) prepared for the project by Fehr & Peers,[1] as well as the *City of Antioch General Plan*[2] and the associated EIR[3]. All technical calculations are included as an appendix to the TIA, which is included as Appendix K to this EIR.

4.12.2 EXISTING ENVIRONMENTAL SETTING

The section below describes the physical and operational characteristics of the existing transportation system within the project region, including the roadway network, transit, bicycle and pedestrian facilities.

Roadway Network

Regional access to the project area is provided by State Route (SR) 4, Lone Tree Way, Deer Valley Road and, once extended, Sand Creek Road. Dallas Ranch Road would provide local access. Roadways that would provide access to the site and are most likely to experience direct traffic impacts, if any, from the proposed project, are discussed below.

SR 4

SR 4 is an east-west freeway that extends from Hercules in the west to the Stockton and beyond in the east. In the study area, SR 4 has a northwest/southeast orientation between SR 160 and Walnut Boulevard in east Contra Costa County. The facility is an eight-lane freeway in the west to State Route 160, a six-lane freeway from Route 160 to Laurel Road, and a four-lane freeway from Laurel Road to Sand Creek Road. Between Sand Creek Road and Walnut Boulevard, the facility is a two-lane highway with at-grade intersections at Balfour Road and Marsh Creek Road. Each intersection is signalized and operated by the California Department of Transportation (Caltrans). Per the Contra Costa County Transportation Agency (CCTA), SR 4 is a designated "Route of Regional Significance". Routes of Regional Significance are roadways that connect two

1 Fehr & Peers. *The Ranch Transportation Impact Assessment.* February 2018.
2 City of Antioch. *City of Antioch General Plan*. Adopted November 24, 2003.
3 City of Antioch. *City of Antioch General Plan EIR*. July 2003.

or more subareas of Contra Costa County, cross County boundaries, carry significant through traffic, and/or provide access to a regional highway or transit facility.

Lone Tree Way

Lone Tree Way is an east-west roadway located north of the proposed project site. The roadway provides two travel lanes in both directions to the west of Hillcrest Avenue, and three travel lanes in both directions east of Hillcrest Avenue. The posted speed limit is 45 miles per hour (mph). On-street parking is not permitted. Lone Tree Way is a designated Route of Regional Significance.

Sand Creek Road

Sand Creek Road is a four-lane, east-west roadway that extends east from SR 4 through Brentwood. The posted speed limit is 45 mph. On-street parking is not permitted on Sand Creek Road. Class II bicycle lanes and sidewalks are provided along most of the roadway through Brentwood. Sand Creek Road from Brentwood Boulevard to its current terminus at SR 4 is a Route of Regional Significance. When constructed, the future extension of Sand Creek Road would also be a designated Route of Regional Significance.

Deer Valley Road

Deer Valley Road is a north-south roadway connecting Brentwood to Antioch. From south of Balfour Road to the project vicinity, Deer Valley Road is two-lane rural road with adjacent areas mostly undeveloped and agricultural. Along the rural section of the roadway, bicycle and/or pedestrian facilities or paved shoulders are not provided. Near Sand Creek Road, Deer Valley Road widens to provide two travel lanes in each direction, sidewalks adjacent to developed parcels, and Class II bicycle lanes. Deer Valley has a posted speed limit of 45 miles per hour. Deer Valley Road is a designated Route of Regional Significance.

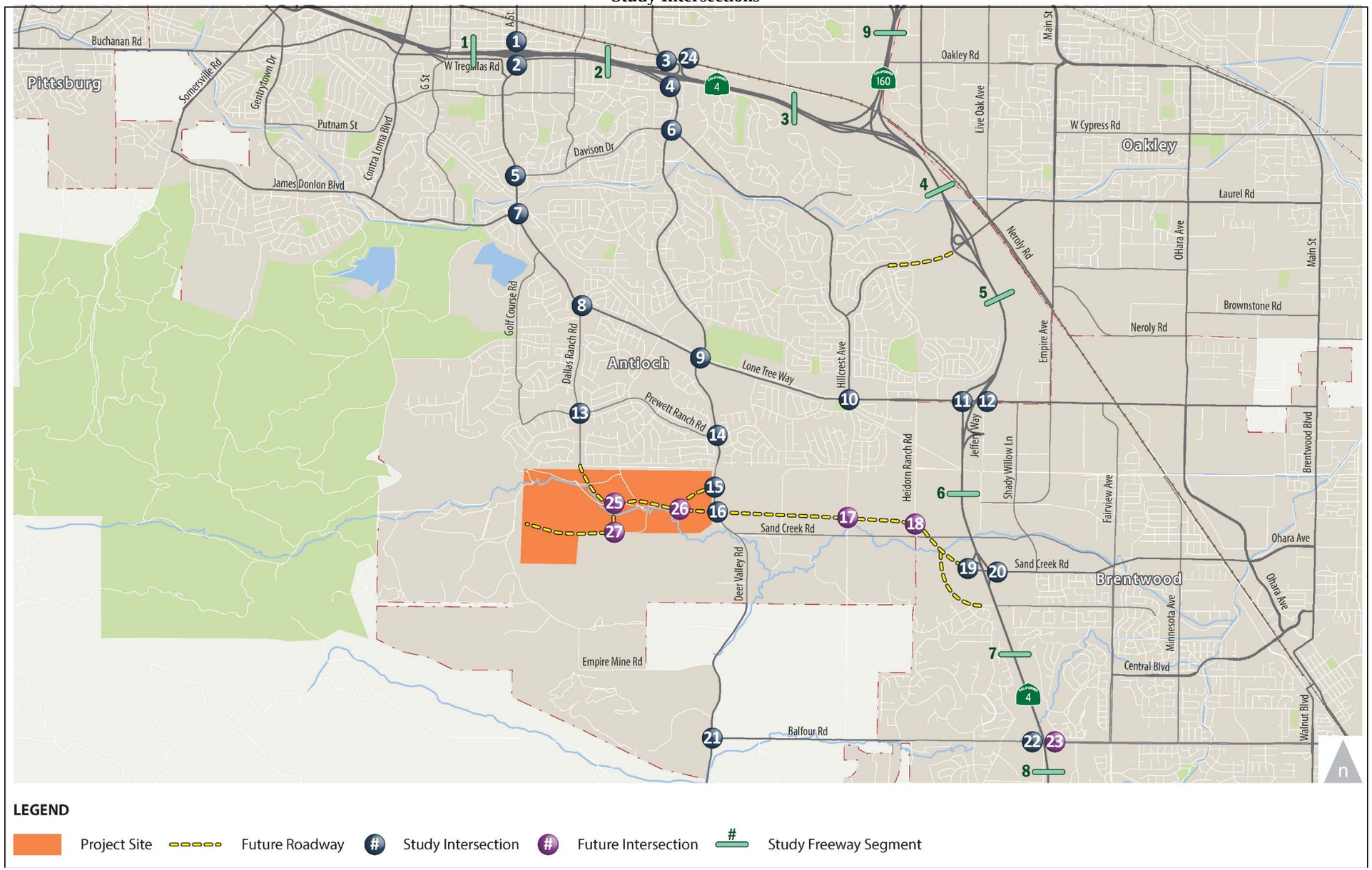
Dallas Ranch Road

Dallas Ranch Road is a four lane north-south roadway that would connect the proposed Sand Creek Road extension within the project site to Lone Tree Way. Two travel lanes are provided in each direction with bicycle lanes and sidewalks. Dallas Ranch Road does not provide any direct residential access. The posted speed limit on Dallas Ranch Road is 45 miles per hour, although a temporary posted 25 mph zone occurs at the southerly approach to the terminus.

Study Intersections

The following study intersections were selected for analysis in the TIA selected based on the project location, estimates of project-generated traffic, and locations of planned roadways in the project vicinity (see Figure 4.12-1):

Figure 4.12-1
Study Intersections



Source: Fehr & Peers, 2018.

1. Lone Tree Way/A Street/SR 4 Westbound Ramps
2. Lone Tree Way/A Street/SR 4 Eastbound Ramps
3. Hillcrest Avenue/Sunset Drive/Slatten Ranch Road
4. Hillcrest Avenue/ SR 4 Eastbound Ramps
5. Lone Tree Way/Davison Drive
6. Deer Valley Road/Hillcrest Avenue/Davison Drive
7. Lone Tree Way/James Donlon Boulevard
8. Lone Tree Way/Dallas Ranch Road
9. Lone Tree Way/Deer Valley Road
10. Lone Tree Way/Hillcrest Avenue
11. Lone Tree Way/SR 4 Eastbound Ramps
12. Lone Tree Way/SR 4 Westbound Ramps/Jeffery Way
13. Prewett Ranch Drive/Dallas Ranch Road
14. Prewett Ranch Drive/Deer Valley Road
15. Deer Valley Road/Wellness Way/Street A
16. Sand Creek Road/Deer Valley Road
17. Sand Creek Road/Hillcrest Avenue (future intersection)
18. Sand Creek Road/Heidorn Ranch Road (future intersection)
19. Sand Creek Road/SR 4 Eastbound Ramps
20. Sand Creek Road/SR 4 Westbound Ramps
21. Balfour Road/Deer Valley Road
22. Balfour Road/SR 4 (analyzed as an at-grade intersection in the existing condition and Balfour Road/SR 4 Eastbound Ramps in near-term and cumulative conditions)
23. Balfour Road/SR 4 Westbound Ramps (near-term and cumulative conditions only)
24. Slatten Ranch Road/SR 4 Westbound Ramps
25. Sand Creek Road/B Street (internal intersection)
26. Sand Creek Road/A Street (internal intersection)
27. B Street/C Street (internal intersection)

In addition, the following freeway segments were evaluated:

1. SR 4, west of Lone Tree Way/A Street
2. SR 4, west of Hillcrest Avenue
3. SR 4, west of SR 160
4. SR 4, west of Laurel Road
5. SR 4, west (north) of Lone Tree Way
6. SR 4, west (north) of Sand Creek Road
7. SR 4, west (north) of Balfour Road
8. SR 4, east (south) of Balfour Road
9. SR 160, north of SR 4

Common Traffic Analysis Terms

The operations of roadway facilities are described with the term level of service (LOS), a qualitative description of traffic flow from a vehicle driver's perspective based on factors such as speed, travel time, delay, and freedom to maneuver. Six levels of service are defined ranging from

LOS A (free-flow conditions) to LOS F (over capacity conditions). LOS E corresponds to operations "at capacity." When volumes exceed capacity, stop-and-go conditions result and operations are designated LOS F.

Table 4.12-1 and Table 4.12-2 summarize the relationship between delay and LOS for signalized and unsignalized intersections. The delay ranges for unsignalized intersections are lower than for signalized intersections as drivers expect less delay at unsignalized intersections.

Table 4.12-1
Signalized Intersection LOS Definitions

LOS	Description of Operations	Average Delay (seconds per vehicle)
A	Progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	≤ 10
B	Progression is good, cycle lengths are short, or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10 to 20
C	Higher congestion may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, though many still pass through the intersection without stopping.	> 20 to 35
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	> 35 to 55
E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55 to 80
F	This level is considered unacceptable with oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below	> 80

Source: Fehr & Peers, 2018.

Table 4.12-2
Unsignalized Intersection LOS Definitions

LOS	Description of Operations	Average Delay (seconds per vehicle)
A	Little or no delays	≤ 0 to 10
B	Short traffic delays	> 10 to 15
C	Average traffic delays	> 15 to 25
D	Long traffic delays	> 25 to 35
E	Very long traffic delays	> 35 to 50
F	Extreme traffic, delays where intersection capacity exceeded	> 50

Source: Fehr & Peers, 2018.

For freeway segments, the *East County Action Plan for Routes of Regional Significance* has established the delay index as the Multimodal Transportation Service Objective (MTSO) for SR 4

and SR 160 through the study area. The delay index is the ratio of travel time on a facility divided by the travel times that occur during non-congested free-flow periods. Should the delay index exceed 2.5 during either the AM or PM peak period, freeway operations would be considered deficient. A delay index of 2.5 would equate to peak hour travel taking 2.5 times as long as off-peak travel or an average travel speed below 26 miles per hour assuming a non-congested free-flow speed of 65 miles per hour.

Existing Intersection Conditions

Weekday morning (7:00 AM to 9:00 AM) and evening (4:00 PM to 6:00 PM) peak period intersection turning movement counts were collected at the study intersections, including separate counts of pedestrians and bicyclists, in August 2017 with area schools in normal session. Existing intersection lane configurations, signal timings, and peak hour turning movement volumes were used to calculate the LOS for the study intersections during each peak hour. The results of the LOS analysis for Existing Conditions are presented in Table 4.12-3.

As shown in the table, signalized study intersections generally operate within the level of service standards set by the City of Antioch and Contra Costa County, except for the Hillcrest Avenue/SR 4 Eastbound Ramps intersection, which operates at an overall LOS F during both the morning and evening peak hour. Poor operations are primarily due to the close proximity of the adjacent intersection (Hillcrest Avenue at Tregallas Road/Larkspur Drive), poor vehicle progression between closely spaced intersections which does not make efficient use of green time, and lane utilization imbalances for the eastbound right-turn movement from the off-ramp as well as the northbound through movement. However, the unsignalized intersection of Deer Valley Road at Balfour Road currently experiences high levels of delay for vehicles turning from Balfour Road to Deer Valley Road during the morning peak hour. Per the TIA, the intersection currently meets peak hour signal warrants during the morning peak hour.

In the Existing Condition, average left-turn vehicle queues are contained within the available storage with the 95th percentile vehicle queue for some movements within the roadway network potentially extending beyond the available storage, including the following:

- Hillcrest Avenue/State Route 4 Eastbound Ramps (northbound through movement, AM and PM peak hour);
- Lone Tree Way/A Street at SR 4 Westbound Ramps (northbound left-turn, AM peak hour);
- Hillcrest Avenue at Davison Drive/Deer Valley Road (eastbound left, AM Peak Hour; northbound left, PM peak hour);
- Lone Tree Way at James Donlon Boulevard/Ridgerock Drive (eastbound left-turn and northbound left-turn, AM and PM peak hours);
- Lone Tree Way at Dallas Ranch Road/Eagleridge Drive (westbound left-turn and northbound left- turn, AM peak hour);
- Lone Tree Way at Deer Valley Road (northbound left-turn, AM peak hour); and
- Dallas Ranch Road at Prewett Ranch Drive/Prewett Ranch Road (southbound left, AM peak hour).

Table 4.12-3
Intersection LOS – Existing Conditions

Intersection	Control[1]	Peak Hour	Delay[2]	LOS
1. Lone Tree Way/A Street/SR 4 Westbound Ramps	Signal	AM	14	B
		PM	9	A
2. Lone Tree Way/A Street/SR 4 Eastbound Ramps	Signal	AM	16	B
		PM	16	B
3. Hillcrest Avenue/Sunset Drive/Slatten Ranch Road	Signal	AM	15	B
		PM	15	B
4. Hillcrest Avenue /SR4 Eastbound Ramps	Signal	AM	**86**	**F**
		PM	**121**	**F**
5. Lone Tree Way/Davison Drive	Signal	AM	17	B
		PM	15	B
6. Deer Valley Road/ Hillcrest Avenue/Davison Drive	Signal	AM	26	C
		PM	26	C
7. Lone Tree Way/James Donlon Boulevard	Signal	AM	21	C
		PM	17	B
8. Lone Tree Way/Dallas Ranch Road	Signal	AM	31	C
		PM	16	B
9. Lone Tree Way/Deer Valley Road	Signal	AM	34	C
		PM	25	C
10. Lone Tree Way/Hillcrest Avenue	Signal	AM	19	B
		PM	21	C
11. Lone Tree Way/SR 4 Eastbound Ramps	Signal	AM	16	B
		PM	39	D
12. Lone Tree Way/SR 4 Westbound Ramps/Jeffery Way	Signal	AM	8	A
		PM	12	B
13. Prewett Ranch Drive/Dallas Ranch Road	Signal	AM	18	B
		PM	14	B
14. Prewett Ranch Drive/Deer Valley Road	Signal	AM	29	C
		PM	14	B
15. Deer Valley Road/Wellness Way/Street A	Signal	AM	7	A
		PM	5	A
16. Sand Creek Road/Deer Valley Road	Signal	AM	11	B
		PM	7	A
17. Sand Creek Road/Hillcrest Avenue (future)	Signal	AM	--	--
		PM	--	--
18. Sand Creek Road/Heidorn Ranch Road (future)	Signal	AM	--	--
		PM	--	--
19. Sand Creek Road/SR 4 Eastbound Ramps	Signal	AM	6	A
		PM	5	A
20. Sand Creek Road/SR 4 Westbound Ramps	Signal	AM	4	A
		PM	5	A
21. Balfour Road/Deer Valley Road	SSSC	AM	30 (**58**)	D (**F**)
		PM	8 (13)	A (B)
22. Balfour Road/SR 4[3]	Signal	AM	45	D
		PM	38	D

(Continued on next page)

Table 4.12-3
Intersection LOS – Existing Conditions

Intersection	Control[1]	Peak Hour	Delay[2]	LOS
24. Slatten Ranch/SR 4 Westbound Ramps	Signal	AM	9	A
		PM	8	A

Notes:
Facilities that operate below acceptable levels are shown in **BOLD**.
[1] Signal = signalized intersection
[2] Average intersection delay is calculated for all signalized intersections using the HCM method for vehicles.
[3] Analyzed as an at-grade intersection in the Existing Condition and Balfour Road/SR 4 Eastbound Ramps in Near-Term and Cumulative Conditions.

Source: Fehr & Peers, 2018.

Existing Freeway Conditions

Mainline traffic counts were conducted on SR 4 south of Balfour Road in August 2017. Traffic volumes at the interchanges along the corridor were used to estimate traffic volumes on the mainline segments from south of Balfour Road to west of Lone Tree Way/A Street. The traffic volumes and number of travel lanes were used to calculate vehicle speeds using the HCM 2010 method, which were then used to calculate the delay index.

Currently, SR 4 north of Sand Creek Road operates at free-flow speeds during both the morning and evening peak hour. SR 4 between Balfour Road and Sand Creek Road experiences congestion during peak hours with a delay index between 1.4 and 4.3 during the morning and evening peak hours depending on the direction of travel, indicating that peak period travel takes approximately two to four times as long as off-peak period travel. As such, SR 4 between Balfour Road and Sand Creek Road exceeds the established MTSO (delay index of less than 2.5 during either the AM or PM peak period). However, SR 4 is currently being widened to improve operations at the aforementioned segment. All other mainline study freeway segments currently operate acceptably.

Transit System

Two major public mass transit operators provide service within or adjacent to the study area, including Bay Area Rapid Transit (BART) and the Eastern Contra Costa Transit Authority (Tri Delta Transit).

BART

BART is a rapid mass transit system which provides regional transportation connections to much of the Bay Area. BART runs from the North Bay Area in Richmond to the South Bay Area in Fremont. In the east-west direction BART runs from Pittsburg to the San Francisco Airport and Milbrae with several connections in Oakland. The Pittsburg/Bay Point BART station, which is approximately 13 miles northeast of the project site, serves all of Pittsburg, Bay Point, Antioch, and all other surrounding cities and runs from 4:00 AM to 12:00 AM daily, with a weekday frequency of 15 minutes. An E-BART extension to Hillcrest Avenue in Antioch is expected to be

operational in May of 2018. The E-BART service will connect with BART at the Bay Point BART station. It should be noted that an additional E-BART Station is also planned at Railroad Avenue and the widening of SR 4 has recently been completed to accommodate the planned station.

Tri Delta Transit

Tri-Delta Transit provides transit service in eastern Contra Costa County, serving the communities of Brentwood, Antioch, Oakley, Concord, Discovery Bay, Bay Point and Pittsburg. Thirteen routes operate on weekdays, with four routes operating on weekends. Three routes operate in the vicinity of the Project site, with Routes 379, 388, and 392 stopping at the Kaiser Medical Center on Deer Valley Road, opposite from the project site. Route 388 also has stops on Dallas Ranch Road and Prewett Ranch Road.

Routes 388 and 392 provide access to the Pittsburg BART station, with Route 388 providing weekday service on 30-to 60-minute headways and Route 392 providing weekend service on 60-minute headways. The routes also connect to the Kaiser Medical Center, Sutter Delta Medical Center, Downtown Antioch, the Antioch Park-n-Ride lot at Hillcrest Avenue, the Pittsburg Park-n-Ride lot, and multiple schools. Route 379 provides weekday school service with one morning bus from the Antioch Park-n-Ride lot to Kaiser Medical Center. It should be noted that Tri Delta Transit plans to adjust some transit routes to better serve the Hillcrest Avenue and Railroad Avenue E-BART stations. In addition to the regular transit service to the project area, dial-a-ride door-to-door service within Eastern Contra Costa County is provided by Tri Delta Transit for disabled people of all ages and senior citizens.

Bicycle and Pedestrian System

Bicycle paths, lanes and routes are typical examples of bicycle transportation facilities, which are defined by Caltrans as being in one of the following three classes:

- Class I – Bike Paths: Class I bike paths are paved trails that are separated from roadways. The trails are shared with pedestrians.

- Class II – Bike Lanes: Class II bike lanes are lanes on roadways designated for use by bicycles through striping, pavement legends, and signs.

- Class III – Bike Routes: Class III bike routes are roadways designated for bicycle use by signs only. The routes may or may not include additional pavement width for cyclists.

In the immediate project vicinity, portions of Deer Valley Road and Dallas Ranch Road provide Class II bicycle facilities with separate lanes designated for bicycle travel. Lone Tree Way in the vicinity has a striped shoulder that can be used by bicyclists along some roadway sections, but does not include a designated bicycle lane. The Class I Mokelumne Trail is located north of the project site, which connects to the Pittsburg/Bay Point BART Station. The existing Dallas Ranch and Prewett Ranch neighborhoods contain a number of Class I bike paths connecting residential neighborhoods to parks and schools.

4.12.3 REGULATORY CONTEXT

Existing transportation policies, laws, and regulations that would apply to the proposed project are summarized below.

State Regulations

Caltrans has jurisdiction over State highways. Therefore, Caltrans controls all construction, modification, and maintenance of State highways, such as SR 4. Any improvements to such roadways would require Caltrans approval.

Guide for the Preparation of Traffic Impact Studies

Caltrans' *Guide for the Preparation of Traffic Impact Studies* (December 2002) provides guidance for Caltrans staff who review local development and land use change proposals. The Guide also informs local agencies about the information needed for Caltrans to analyze the traffic impacts to state highway facilities, which include freeway segments, on- or off-ramps, and signalized intersections.

Local Regulations

Contra Costa Countywide Transportation Plan

The CCCTA is a public agency formed by the Contra Costa voters to manage the County's transportation sales tax program and to do countywide transportation planning. The 2017 Countywide Comprehensive Transportation Plan, adopted September 20, 2017, is the CCTA's most recent, broadest policy and planning document.[4] The Plan identifies the criteria for analyzing transportation impacts and sets forth plans for future roadway improvements in the County. In addition, the Plan relies on collaboration with and between partners, both on the countywide and regional levels. Each of the County's five Regional Transportation Planning Committees created an Action Plan, which identifies a complete list of actions to be completed as a result of the Action Plan.

Central and East County Action Plans

As part of the Action Plan process, each Regional Transportation Planning Committee identified projects and programs in the form of actions to be included in the Action Plan for the Routes of Regional Significance. Each Action Plan states the vision, goals, and policies; designates Routes of Regional Significance; sets objectives for such routes; and presents specific actions to achieve established objectives. The actions are listed on both a route-by-route and a regional scale, and aim to support the transportation objectives as specified by each Regional Transportation Planning Committee. The latest *East County Action Plan for Routes of Regional Significance* was adopted September 2017.

[4] Contra Costa County Transportation Authority. *2017 Countywide Comprehensive Transportation Plan.* Adopted September 20, 2017.

City of Antioch General Plan

The following are the City of Antioch's policies relevant to transportation and circulation.

Objective 7.3.1 Provide adequate roadway capacity to meet the roadway performance standards set forth in the Growth Management Element.

Policy 7.3.2.a Facilitate meeting the roadway performance standards set forth in the Growth Management Element and improving traffic flow on arterial roadways.

- Work with the UP and BNSF railroads to construct grade separations along the tracks at Somersville Road, Hillcrest Avenue, "A" Street, the proposed Viera Road extension, and the proposed Phillips Lane extension.
- Promote the design of roadways to optimize safe traffic flow within established roadway configurations by minimizing driveways and intersections, uncontrolled access to adjacent parcels, on-street parking, and frequent stops to the extent consistent with the character of adjacent land uses.
- Provide adequate capacity at intersections to accommodate future traffic volumes by installing intersection traffic improvements and traffic control devices, as needed, as development occurs.
- Facilitate the synchronization of traffic signals.
- Where needed, provide acceleration and deceleration lanes for commercial access drives.
- Provide for reciprocal access and parking agreements between adjacent land uses, thereby facilitating off-street vehicular movement between adjacent commercial and other nonresidential uses.
- Encourage regional goods movement to remain on area freeways and other appropriate routes.

Policy 7.3.2.b Design and reconfigure collector and local roadways to improve circulation within and connections to residential and commercial areas.

- Implement appropriate measures to mitigate speeding and other traffic impacts in residential areas.
- Implement roadway patterns that limit through traffic on local residential streets.

Policy 7.3.2.c Require the design of new developments to focus through traffic onto arterial streets.

Policy 7.3.2.d Where feasible, design arterial roadways, including routes of regional significance, to provide better service than the minimum standards set forth in Measure C and the Growth Management Element. Thus, where feasible, the City will strive to maintain a "High D" level of service (v/c [volume-to-capacity ratio] = 0.85 to 0.89) within regional commercial areas and at intersections within 1,000 feet of a freeway interchange. The City will also strive where feasible to maintain low-range "D" (v/c = 0.80 to 0.84) in all other areas of the City, including freeway interchanges.

Policy 7.3.2.e Establish Assessment Districts in areas that will require major roadway infrastructure improvements that will benefit only that area of the City, and thereby facilitate the up-front construction of needed roadways.

Policy 7.3.2.f Design street intersections to ensure the safe passage of through traffic and accommodate anticipated turning movements. Implement intersection improvements consistent with the following lane geometrics, unless traffic analyses indicate the need for additional turn lanes.

Policy 7.3.2.g Require traffic impact studies for all new developments that propose to increase the approved density or intensity of development or are projected to generate 50 peak hour trips or more at any intersection of Circulation Element roadways. The purpose of these studies is to demonstrate that:

- The existing roadway system, along with roads to be improved by the proposed project, can meet the performance standards set forth in Sections 3.4.1 and 3.4.2 of the Growth Management Element; and

- Required findings of consistency with the provisions of the Growth Management Element can be made.

Policy 7.3.2.k Where single family residences have no feasible alternative but to front on collector or arterial roadways, require, wherever possible, that circular driveways or on-site turnarounds be provided to eliminate the need for residents to back onto the street.

Policy 7.3.2.l Locate driveways on corner parcels as far away from the intersection as is possible.

Policy 7.3.2.m Avoid locating driveways within passenger waiting areas of bus stops or within bus bays. Locate driveways so that drivers will be able to see around bus stop improvements.

Policy 7.3.2.n Use raised medians as a method for achieving one or more of the following objectives: access control, separation of opposing traffic flows, left turn storage, aesthetic improvement, and/or pedestrian refuge.

Policy 7.3.2.o Where medians are constructed, provide openings at the maximum feasible intervals, typically no less than 1/8 mile.

Policy 7.3.2.v Private streets, where permitted, shall provide for adequate circulation and emergency vehicle access. Private streets that will accommodate more than 50 vehicles per hour in the peak hour or that are designed for on-street parking shall be designed to public street standards. The design of other private streets shall be subject to the review and approval of the City Engineer. Private streets shall be improved to public street standards prior to acceptance of dedications to the City.

Policy 7.3.2.x Require new development to construct all on-site roadways, including Circulation Element routes, and provide a fair share contribution for needed off-site improvements needed to maintain the roadway performance standards set forth in the Growth Management Element. Contributions for off-site improvements may be in the form of fees and/or physical improvements, as determined by the City Engineer. Costs associated with mitigating off-site traffic impacts should be allocated on the basis of trip generation, and should

have provisions for lower rates for income-restricted lower income housing projects needed to meet the quantified objectives of the General Plan Housing Element.

Objective 7.4.1 Maintenance of a safe, convenient, and continuous network of pedestrian sidewalks, pathways, and bicycle facilities serving both experienced and casual bicyclists to facilitate bicycling and walking as alternatives to the automobile.

Policy 7.4.2.a Design new residential neighborhoods to provide safe pedestrian and bicycle access to schools, parks and neighborhood commercial facilities.

Policy 7.4.2.b Design intersections for the safe passage of pedestrians and bicycles through the intersection.

Policy 7.4.2.c Provide street lighting that is attractive, functional, and appropriate to the character and scale of the neighborhood or area, and that contributes to vehicular, pedestrian, and bicycle safety.

Policy 7.4.2.d Maintain roadway designs that maintain mobility and accessibility for bicyclists and pedestrians.

Policy 7.4.2.e Integrate multi-use paths into creek corridors, railroad rights-of-way, utility corridors, and park facilities.

Policy 7.4.2.f Provide, as appropriate, bicycle lanes (Class II) or parallel bicycle/pedestrian paths (Class I) along all arterial streets and high volume collector streets, as well as along major access routes to schools and parks.

Policy 7.4.2.j Permit the sharing or parallel development of pedestrian walkways with bicycle paths, where this can be safely accomplished, in order to maximize the use of public rights-of-way.

Policy 7.4.2.l Require the construction of attractive walkways in new residential, commercial, office, and industrial developments, including provision of shading for pedestrian paths.

Policy 7.4.2.m Maximize visibility and access for pedestrians, and encourage the removal of barriers for safe and convenient movement of pedestrians.

Policy 7.4.2.n Ensure that the site design of new developments provides for pedestrian access to existing and future transit routes and transit centers.

Policy 7.4.2.o Pave walks and pedestrian pathways with a hard, all-weather surface that is easy to walk on. Walks and curbs should accommodate pedestrians with disabilities. Walks within open space areas should have specially paved surfaces that blend with the surrounding environment.

Policy 7.4.2.p In general, design walks to provide a direct route for short to medium distance pedestrian trips, and to facilitate the movement of large numbers of pedestrians. Meandering sidewalks are appropriate in areas where the natural topography or low-density land uses lend themselves to informal landscapes.

Objective 7.5.1 Maintenance of rail and bus transit, providing both local and regional service that is available throughout the week, and operates on par with automobile travel during peak commute hours.

Policy 7.5.2.g Preserve options for future transit use when designing roadway and highway improvements.

Policy 7.5.2.i Include Tri-Delta Transit in the review of new development projects, and require new development to provide transit improvements in proportion to traffic demands created by the project. Transit improvements may include direct and paved access to transit stops, provision of bus turnout areas and bus shelters, and roadway geometric designs to accommodate bus traffic.

Objective 3.4.3 Maintain acceptable traffic levels of service on City roadways through implementation of Transportation Systems Management, Growth Management, and the City's Capital Improvement Program, and ensure that individual development projects provide appropriate mitigation for their impacts.

Policy 3.4.4.a Place ultimate responsibility for mitigating the impacts of future growth and development, including construction of new and widened roadways with individual development projects. The City's Capital Improvements Program will be used primarily to address the impacts of existing development, and to facilitate adopted economic development programs.

Policy 3.4.4.b Continue to develop and implement action plans for routes of regional significance (see Circulation Element requirements).

Policy 3.4.4.c Ensure that development projects pay applicable regional traffic mitigation fees and provide appropriate participation in relation to improvements for routes of regional significance (see also Circulation Element Policy 5.3.1f).

Policy 3.4.4.d Consider level of service standards along basic routes to be met if 20-year projections based on the City's accepted traffic model indicate that conditions at the intersections that will be impacted by the project will be equivalent to or better than those specified in the standard, or that the proposed project has been required to pay its fair share of the improvement costs needed to bring operations at impacted intersections into conformance with the applicable performance standard.

4.12.4 IMPACTS AND MITIGATION MEASURES

The standards of significance to be used in identifying project-specific and cumulative impacts are presented. The standards are based on policies of the City of Antioch and other responsible agencies. In addition, the methods used to analyze the impacts of the project on the roadway, bicycle, pedestrian, and transit systems are provided in this section. A discussion of the project's impacts, as well as mitigation measures where necessary, is also presented.

Standards of Significance

The following thresholds of significance were developed based on City of Antioch and East Contra Costa County Action Plan policies, as well as the CEQA Appendix G checklist criteria:

- Would the project conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including, but not limited to, intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?
    - Would the operations of a study intersection not on a Route of Regional Significance decline from LOS D (an average delay of 55 seconds for signalized intersections) or better to LOS E or F, based on the HCM LOS method, with the addition of project traffic?
    - Would the project deteriorate already unacceptable operations at a signalized intersection by adding traffic?

  - Would the operations of an unsignalized study intersection decline from acceptable to unacceptable with the addition of project traffic, and would the installation of a traffic signal at based on the *Manual on Uniform Traffic Control Devices* (MUTCD) Peak Hour Signal Warrant (Warrant 3), be warranted?
  - Would construction traffic from the project have a significant, though temporary, impact on the environment, or would project construction substantially affect traffic flow and circulation, parking, and pedestrian safety?

- Would the project conflict with an applicable congestion management program, including, but not limited to, LOS standards and travel demand measures, or other standards established by the County's congestion management agency for designated roads and highways?

  - Would the project result in or worsen unacceptable conditions on SR 4, based on delay index calculations?
  - Would the project cause a high-occupancy vehicle (HOV) lane on SR 4 to exceed 600 vehicles per hour?

- Would the project result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks?
- Would the project substantially increase traffic hazards due to a design feature (e.g. sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment)?
- Would the project result in inadequate emergency access?
- Would the project conflict with adopted policies, plans, or programs regarding public transit, bicycle or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

Method of Analysis

The analysis methodology provided in the TIA prepared for the proposed project by Fehr & Peers is discussed below.

Analysis Scenarios

The following analysis scenarios are included in this chapter:

- *Existing Conditions:* LOS based on existing (2017) peak hour volumes and existing (2017) intersection configurations.
- *Existing Plus Project Conditions:* Existing traffic volumes plus trips from the proposed project (Multi-Generational and Traditional Plans).
- *Near-Term Conditions:* This scenario is based on the existing volumes plus growth in background traffic (for five to ten years) plus the traffic from all reasonably foreseeable developments that could substantially affect the volumes at the project study intersections.

- *Near-Term Plus Project Conditions:* This scenario is based on Near-Term Conditions plus the trips from the proposed project (Multi-Generational and Traditional Plans).
- *Cumulative Conditions:* This scenario includes cumulative volumes based on traffic growth trends as described in both the Antioch and Brentwood General Plan EIRs, and supplemented by a check of traffic forecasts for the study area in the most recent Contra Costa Transportation Authority Countywide travel demand model. The scenario reflects conditions over the next 20 to 25 years.
- *Cumulative Plus Project Conditions:* This scenario is based on Cumulative Conditions plus the trips from the proposed project (Multi-Generational and Traditional Plans).

Intersections

Traffic conditions at signalized intersections were evaluated using methods developed by the Transportation Research Board (TRB), as documented in the 2010 *Highway Capacity Manual* (2010 HCM) for vehicles using the analysis software Synchro 9.0. The HCM method calculates control delay at an intersection based on inputs such as traffic volumes, lane geometry, signal phasing and timing, pedestrian crossing times, and peak hour factors. Control delay is defined as the delay directly associated with the traffic control device (i.e., a stop sign or a traffic signal) and specifically includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

The HCM describes the method for evaluating LOS and delay at unsignalized (all-way stop controlled and two-way stop controlled) intersections. LOS at unsignalized intersections is also defined by the average control delay per vehicle (measured in seconds). The control delay incorporates delay associated with deceleration, acceleration, stopping, and moving up in the queue. At side-street stop controlled intersections, the delay is calculated for each stop-controlled movement, the left turn movement from the major street, as well as the intersection average. The intersection average delay and highest movement/approach delay are reported for side-street stop controlled intersections.

Freeway Segments

As discussed previously, the CCTA's *East County Action Plan for Routes of Regional Significance* establishes the delay index as the MTSO for SR 4 through the study area. The delay index is the ratio of actual travel times on a facility divided by the travel times that occur during non-congested free-flow periods. If the delay index would exceed 2.5 during either the AM or PM peak period, freeway operations would be considered deficient. Such conditions would equate to peak hour travel taking 2.5 times as long as off-peak travel or an average travel speed below 26 mph assuming a non-congested free-flow speed of 65 mph.

Project Trip Generation

For the purposes of this EIR, the proposed project includes two development scenarios: a Multi-Generational Plan and a Traditional Plan. Vehicle trip generation associated with both scenarios is summarized in Table 4.12-4 below.

Table 4.12-4
Project Trip Generation

Land Use	Size	ADT[1]	Am Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Multi-Generational Plan								
Age Restricted Single-Family Homes[1]	500 units	1,840	40	70	110	80	55	135
Market-Rate Single Family Homes[2]	807 units	7,680	151	454	605	508	299	807
General Commercial[3]	54,000 sf	2,310	32	20	52	96	104	200
Total Project Trips		**11,830**	**223**	**544**	**767**	**684**	**458**	**1,142**
Traditional Plan								
Market-Rate Single Family Homes[2]	1,137 units	10,820	213	640	853	716	421	1,137
General Commercial[3]	54,000 sf	2,310	32	20	52	96	104	200
Total Project Trips		**13,130**	**245**	**660**	**905**	**812**	**525**	**1,337**
Trip Generation Difference Between Multi-Generational and Traditional Plan		**1,300**	**22**	**116**	**138**	**128**	**67**	**195**

Notes:
[1] ITE land use category 251 - Senior Adult Housing.
[2] ITE land use category 210 – Single-Family Homes.
[3] ITE land use category 820 – General Commercial.

Source: Fehr & Peers, 2018.

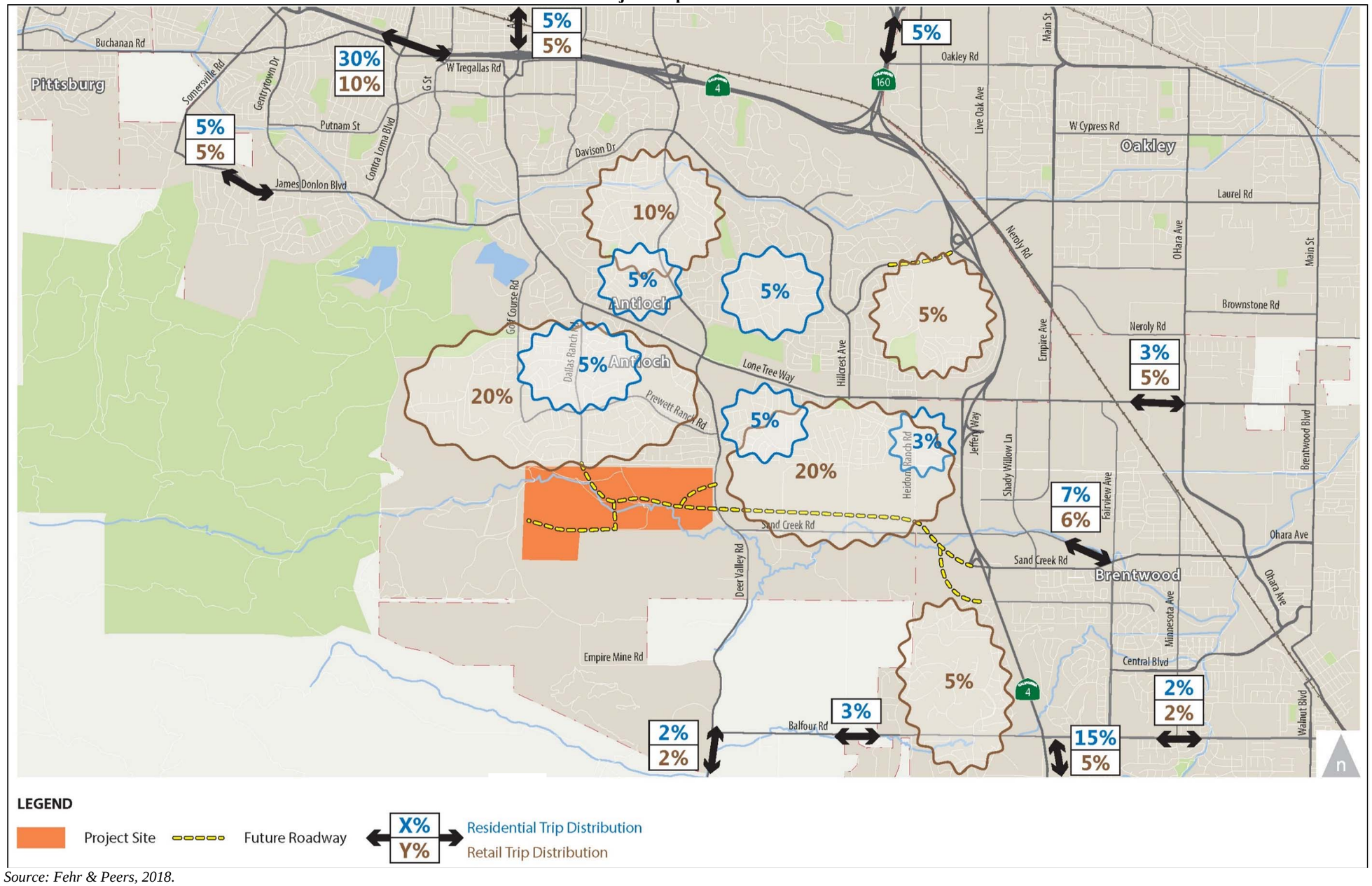
Under the Multi-Generational Plan, the proposed project would generate approximately 11,830 daily vehicle trips, including approximately 770 morning peak hour and 1,150 evening peak hour trips. Under the Traditional Plan, the project would generate approximately 13,130 daily vehicle trips, including approximately 910 morning peak hour and 1,340 evening peak hour trips.

Trip generation estimates for both scenarios account for the trip-generating potential of the proposed commercial uses along Deer Valley Road. It should be noted that portion of such trips could already be on the roadway system, and, thus, would be considered pass-by or diverted trips. However, in order to provide a conservative analysis, pass-by or diverted trip reductions were not applied.

Project Trip Distribution

Estimates of regional project trip distribution were developed based on existing travel patterns in the area, a select zone analysis using the CCTA travel demand model, and the location of complementary land uses, such as schools, employment centers, and retail/recreational opportunities. A summary of the assumed trip distribution is shown in Figure 4.12-2 below.

Figure 4.12-2
Project Trip Distribution



Source: Fehr & Peers, 2018.

Separate estimates were developed for the residential and commercial components of the project. Based on the assumed trip distribution, new vehicle trips generated by the proposed project were assigned to the street network in the Existing Plus Project and Cumulative Plus Project Conditions. It should be noted that the future roadway network would include the extension of Sand Creek Road between Deer Valley Road and SR 4, as well as completion of the Balfour Road interchange.

Project Phasing

As discussed in Chapter 3, Project Description, of this EIR, the proposed project is proposed to be constructed in three major phases. As the project site would likely be built out over multiple years, the transportation impacts of the project may not materialize until substantial portions of the project are built and occupied.

The TIA prepared for the proposed project assumed that two roadway connections from Deer Valley Road would be constructed, as well as all frontage improvements on Deer Valley Road in Phase 1. Sand Creek Road would be extended into the project site to provide access to individual neighborhoods. Land uses that would be developed would include the Village Center and 412 single-family homes. The level of development occurring under Phase 1 would be the same for both the Multi-Generational and Traditional Plans.

The TIA prepared for the proposed project assumed that Sand Creek Road would be extended further into the site to provide an additional neighborhood access point in Phase 2. In order to provide a conservative analysis, the extension of Sand Creek Road to the existing terminus of Dallas Ranch Road was not assumed. Additional land uses that would be developed in Phase 2 would include 210 single-family homes. The level of development occurring under Phase 2 would be the same for both the Multi-Generational and Traditional Plans. Phase 3 would include full buildout of the proposed project site, including connection of Sand Creek Road to Dallas Ranch Road.

To estimate traffic volumes for each project phase, project trips were added to the traffic occurring under Existing Conditions, Near-Term Conditions, and Cumulative Conditions. Intersection LOS analysis was conducted based on the methods outlined above. Based on the results of the LOS analysis, mitigation timing for each of the project's potential intersection impacts was adjusted to ensure that the mitigation would be implemented at the appropriate phase of development.

Existing Scenarios

The existing scenarios include Existing Conditions and Existing Plus Project Conditions. The existing scenario is based on current (2017) traffic counts, existing roadway network, existing roadway geometry, and existing traffic control. The Existing Plus Project Condition includes the Existing Condition plus traffic generated by the project.

Near-Term Scenarios

The latest *City of Brentwood Project Status Report* (April 1, 2017 for commercial projects and July 1, 2017 for residential projects) and *City of Antioch Project Pipeline* (as of September 6,

2017), at the time the project's Notice of Preparation (NOP) was issued, were reviewed to identify developments that could be constructed and occupied in the area over the next five to 10 years. Based on a review of the list, a number of developments were identified that could generate additional traffic through the study area. The proposed developments are summarized in Table 4.12-5, and the locations are shown on Figure 4.12-3. Under the Near-Term and Near Term Plus Project Conditions, Sand Creek Road to the east of the project site is analyzed as a two-lane roadway.

Cumulative Scenario

To assess future growth with planned development in both the Cities of Antioch and Brentwood, several sources of data were reviewed, including the Contra Costa County Travel Demand Model (CCTA Model), future traffic projections in consultation with the City of Antioch, future projections from the City of Brentwood General Plan EIR, and projections developed as part of the Aviano and Vineyards at Sand Creek transportation impact studies. Traffic forecasts within the immediate study area were reviewed to ensure that known developments were adequately reflected in the forecasts, such as the Bridle Gate project located on the south side of the proposed Sand Creek extensions, west of SR 4. Minor adjustments were made to the forecasts to balance traffic volumes between closely spaced intersections in the study area. The resulting Cumulative Without Project forecasts are representative of conditions over the next 20 to 25 years. Project-generated traffic was added to the Cumulative Without Project traffic volumes to represent the Cumulative With Project Condition for the Multi-Generational and Traditional Plans. It should be noted that under the Cumulative and Cumulative Plus Project Conditions, Sand Creek Road to the east of the project site is analyzed as a four-lane roadway.

The City of Brentwood is currently developing a Specific Plan for Priority Area 1 (PA-1) located east of Heidorn Ranch Road, south of Lone Tree Way, west of Shady Willow Lane, and north of Sand Creek. Intensified development, as compared to the General Plan assumptions, is proposed. However, zoning and/or land use changes have not been formally developed, and sufficient information is not currently available to account for changed land use plans in the area.

Project-Specific Impacts and Mitigation Measures

The proposed project impacts on the transportation system are evaluated in this section based on the thresholds of significance and methodology described above. Each impact is followed by recommended mitigation to reduce the identified impacts, if needed.

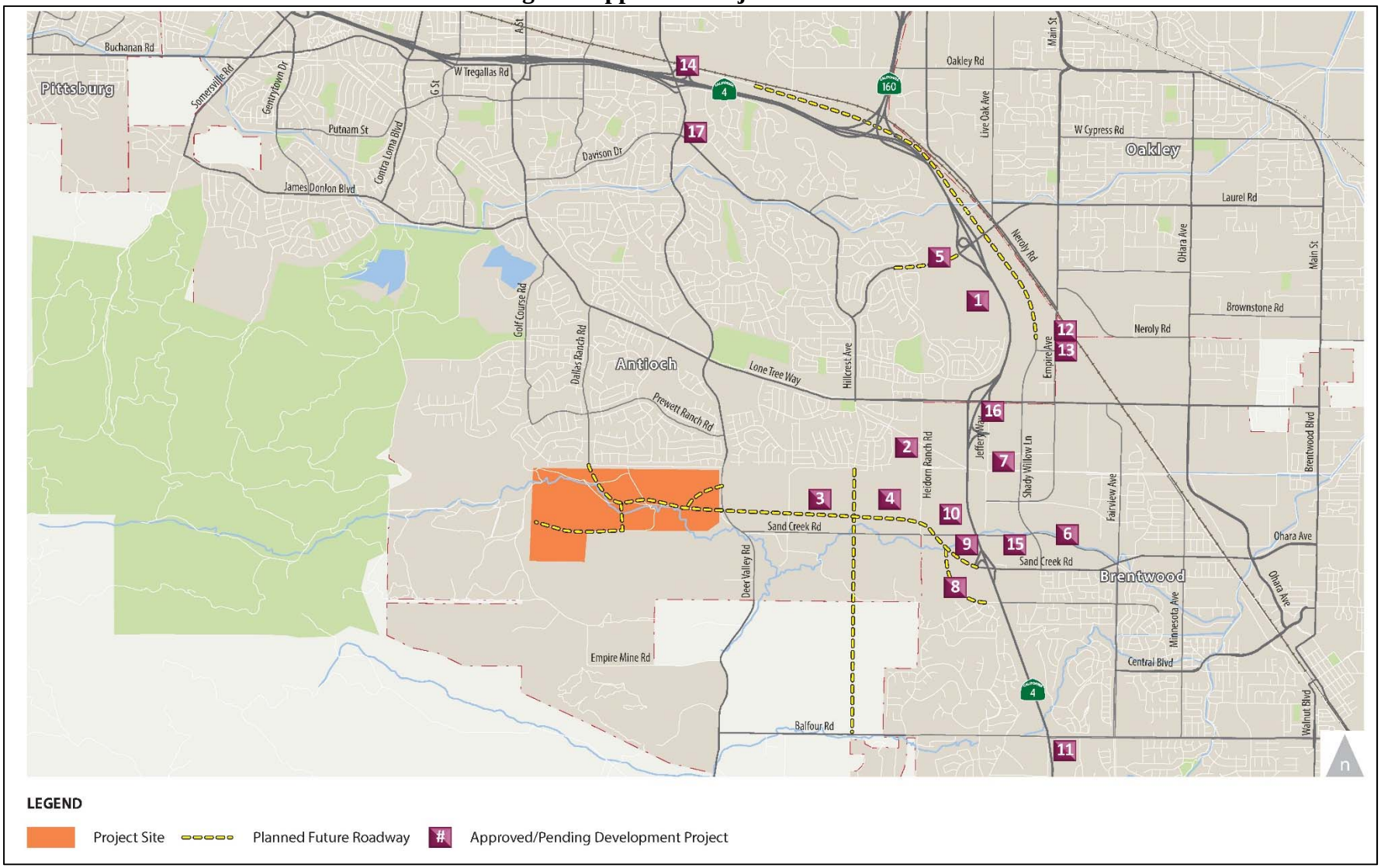
As discussed in Chapter 3, Project Description, of this EIR, two development scenarios for the proposed project are currently being considered: a Multi-Generational Plan and a Traditional Plan. The following discussion of impacts is based on implementation of either of the development scenarios. Where impacts would be similar under both of the development scenarios, the discussion of impacts presented below is applicable for both scenarios. However, where impacts would differ between the two development scenarios, the impacts are discussed separately for each scenario. It should be noted that while potential impacts related to both development scenarios are analyzed, ultimately, only one development scenario would be constructed.

Table 4.12-5
Pending and Approved Projects for the Near-Term Scenario

Map Location	Project Name	Size	Land Use	Status
1	Park Ridge	525 dwelling units	Single Family Homes	Approved, under construction
2	Heidorn Village	117 dwelling units	Single Family Homes	Approved
3	Aviano	533 dwelling units	Single Family Homes	Approved
4	Vineyards at Sand Creek	641 dwelling units	Single Family Homes	Approved
5	Laurel Ranch	178 dwelling units	Single Family Homes	Approved
6	Parkside Villas	37 dwelling units	Single Family Homes	Approved
7	Amber Meadows	69 dwelling units, 126 dwelling units	Single Family Homes Apartments	Pending
8	Bridle Gate Residential Elementary School	265 dwelling units, 700 students	Single Family Homes Elementary School	Pending
9	Bridle Gate Commercial	150,000 square feet	Shopping Center	Pending
10	The Enclave	258 dwelling units	Apartments	Pending
11	Brentwood County Club	63 dwelling units	Detached Active Adult	Approved
12	Orfanos	160 dwelling units	Single Family Homes	Approved
13	Alvarez Partners	48 dwelling units	Single Family Homes	Approved
14	eBART Station		Train Station	Under Construction
15	Streets of Brentwood	320 dwelling units, 32,000 square feet	Apartments Shopping Center	Pending
16	Jeffery Way Retail	54,000 square feet	Shopping Center	Pending
17	Wildflower Station	22 single-family 98 Condos 10-acres commercial	Mixed-Use	Pending

Source: Fehr & Peers, 2018.

Figure 4.12-3
Pending and Approved Projects Locations



Source: Fehr & Peers, 2018.

4.12-1 Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system during construction. Based on the analysis below and with implementation of mitigation, the impact is *less than significant.*

Multi-Generational Plan and Traditional Plan

Construction of the project, including site preparation and construction, and delivery activities, would generate contractor employee trips and a variety of construction-related vehicles. As a result, construction activities could include disruptions to the transportation network near the project site, including the possibility of temporary lane closures, street closures, sidewalk closures, and bikeway closures.

Given the topography of the site, limited import or export of fill is expected. Truck traffic would follow designated truck routes and project construction would stage any large vehicles (i.e., earth-moving equipment, cranes, etc.) on the site prior to beginning site work. The large vehicles would be removed upon project completion. As such, a daily influx of construction equipment is not anticipated.

Detailed information relating to the construction schedule during site development or a construction management plan is not available. Based on information from other residential developments, approximately five workers per day would be needed for each home under construction, with one to two deliveries per week of materials for each home. Not all homes are expected to be under construction at the same time and construction workers tend to arrive/depart work sites outside typical commute periods. Assuming ten percent of homes would be under construction at the peak of project construction, 570 workers could be on-site at one time (up to 114 homes with five workers for each home), plus additional workers, such as building inspectors, foreman, and others. Maximum site activity could result in 2,000 to 3,000 daily trips to/from the site, which is less than would be generated by the project at completion.

Although construction would be temporary, impacts may result during the construction phase of the project when heavy-duty construction vehicles share the roadway with normal vehicle traffic, creating potential conflicts with other roadway users. Thereforethe construction activities associated with the proposed project could result in a ***significant*** impact.

Mitigation Measure(s)
Implementation of the following mitigation measure would reduce the above impact to a *less-than-significant* level by ensuring conflicts between potential construction equipment and activities and other roadway users would be minimized.

Multi-Generational Plan and Traditional Plan

4.12-1 Prior to issuance of grading and building permits, the project applicant shall submit a Traffic Control Plan, subject to review and approval by the

City Engineer. The requirements within the Traffic Control Plan shall include, but are not necessarily limited to, the following elements:

- *Project staging plan to maximize on-site storage of materials and equipment;*
- *A set of comprehensive traffic control measures, including scheduling of major truck trips and deliveries to avoid peak hours; lane closure proceedings; signs, cones, flaggers, and other warning devices for drivers; and designation of construction access routes;*
- *Permitted construction hours;*
- *Identification of parking areas for construction employees, site visitors, and inspectors, including on-site locations; and*
- *Provisions for street sweeping to remove construction-related debris on public streets.*

4.12-2 Study intersections under the Existing Plus Project Condition. Based on the analysis below, even with mitigation, the impact is *significant and unavoidable*.

Average daily trip generation, as well as roadway configurations, would be similar under both the Multi-Generational Plan and the Traditional Plan for the Existing Plus Project Condition. As such, potential impacts from both scenarios are considered below.

Multi-Generational Plan and Traditional Plan

Full build-out of the proposed project would result in an increase of 1,142 to 1,337 average daily vehicle trips in the project area for the Multi-Generational and Traditional Plans, respectively. Table 4.12-6 below shows the Existing and Existing Plus Project delay and LOS for study intersections.

As shown in the table, the addition of project traffic would increase average delay at the signalized study intersections, and would worsen already deficient operations at the Hillcrest Avenue/SR 4 Eastbound Ramp intersection (Intersection #4). Signalized intersections that are currently operating within the City's level of service standard are not projected to degrade beyond the established LOS standard with the addition of project traffic in the existing condition.

Vehicle queues are expected to increase slightly with the addition of project traffic, but would be generally contained within the available storage space. For signalized intersections that are projected to operate at LOS D or better during the morning and evening peak hours, vehicle queue spillback would be adequately managed through signal timing adjustments which the City of Antioch periodically undertakes to optimize travel flow along major corridors.

Table 4.12-6
Existing Plus Project Condition Intersection LOS

Intersection	Control[1]	Peak Hour	Existing		Existing Plus Project (Multi-Generational)		Existing Plus Project (Traditional)	
			Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS
1. Lone Tree Way/A Street/SR 4 Westbound Ramps	Signal	AM	14	B	15	B	16	B
		PM	9	A	10	A	10	A
2. Lone Tree Way/A Street/SR 4 Eastbound Ramps	Signal	AM	16	B	18	B	18	B
		PM	16	B	17	B	18	B
3. Hillcrest Avenue/Sunset Drive/Slatten Ranch Road	Signal	AM	15	B	15	B	15	B
		PM	15	B	15	B	15	B
4. Hillcrest Avenue/ SR 4 Eastbound Ramps	Signal	AM	**86**	**F**	**91**	**F**	**91**	**F**
		PM	**121**	**F**	**> 140**	**F**	**> 140**	**F**
5. Lone Tree Way/Davison Drive	Signal	AM	17	B	18	B	19	B
		PM	15	B	16	B	16	B
6. Deer Valley Road/Hillcrest Avenue/Davison Drive	Signal	AM	26	C	27	C	27	C
		PM	26	C	26	C	26	C
7. Lone Tree Way/James Donlon Boulevard	Signal	AM	21	C	22	C	22	C
		PM	17	B	17	B	18	B
8. Lone Tree Way/Dallas Ranch Road	Signal	AM	31	C	38	D	39	D
		PM	16	B	17	B	19	B
9. Lone Tree Way/Deer Valley Road	Signal	AM	34	C	44	D	46	D
		PM	25	C	34	C	40	D
10. Lone Tree Way/Hillcrest Avenue	Signal	AM	19	B	19	B	19	B
		PM	21	C	21	C	21	C
11. Lone Tree Way/SR 4 Eastbound Ramps	Signal	AM	16	B	16	B	16	B
		PM	39	D	39	D	40	D
12. Lone Tree Way/SR 4 Westbound Ramps/Jeffery Way	Signal	AM	8	A	8	A	8	A
		PM	12	B	12	B	12	B
13. Prewett Ranch Drive/Dallas Ranch Road	Signal	AM	18	B	21	C	21	C
		PM	14	B	14	B	14	B
14. Prewett Ranch Drive/Deer Valley Road	Signal	AM	29	C	33	C	33	C
		PM	14	B	14	B	15	B

(Continued on next page)

Table 4.12-6
Existing Plus Project Condition Intersection LOS

Intersection	Control[1]	Peak Hour	Existing		Existing Plus Project (Multi-Generational)		Existing Plus Project (Traditional)	
			Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS
15. Deer Valley Road/Wellness Way/Street A	Signal	AM	7	A	15	B	16	B
		PM	5	A	12	B	13	B
16. Sand Creek Road/Deer Valley Road	Signal	AM	11	B	17	B	18	B
		PM	7	A	12	B	14	B
17. Sand Creek Road/Hillcrest Avenue (future)	Signal	AM	--	--	--	--	--	--
		PM	--	--	--	--	--	--
18. Sand Creek Road/Heidorn Ranch Road (future)	Signal	AM	--	--	--	--	--	--
		PM	--	--	--	--	--	--
19. Sand Creek Road/SR 4 Eastbound Ramps	Signal	AM	6	A	6	A	6	A
		PM	5	A	5	A	5	A
20. Sand Creek Road/SR 4 Westbound Ramps	Signal	AM	4	A	4	A	4	A
		PM	5	A	5	A	5	A
21. Balfour Road/Deer Valley Road	SSSC	AM	30 (**58**)	D (**F**)	**90 (>120)**	**F (F)**	**109 (>120)**	**F (F)**
		PM	8 (13)	A (B)	10 (16)	A (C)	11 (18)	B (C)
22. Balfour Road/SR 4[3]	Signal	AM	45	D	49	D	49	D
		PM	38	D	38	D	42	D
24. Slatten Ranch/SR 4 Westbound Ramps	Signal	AM	9	A	9	A	9	A
		PM	8	A	8	A	8	A

Notes:
Facilities that operate below acceptable levels are shown in **BOLD**.
[1] Signal = signalized intersection
[2] Average intersection delay is calculated for all signalized intersections using the HCM method for vehicles.
[3] Analyzed as an at-grade intersection in the Existing Condition and Balfour Road/SR 4 Eastbound Ramps in Near-Term and Cumulative Conditions.

Source: Fehr & Peers, 2018.

Nonetheless, at the unsignalized Deer Valley Road and Balfour Road intersection (Intersection #21), the addition of project-generated vehicle trips during the AM peak hour would worsen LOS F conditions for side-street movements for both the Multi-Generational and Traditional Plans, resulting in overall LOS F operations. In addition, peak hour signal warrants would be satisfied without the addition of project traffic. Moreover, the addition of project traffic would worsen already deficient operations at the Hillcrest Avenue/SR 4 Eastbound Ramp intersection (Intersection #4), resulting in increased delays and continued operation of the intersection at LOS F.

The foregoing impacts to intersection operations at Deer Valley Road/Balfour Road (Intersection #21) and Hillcrest Avenue/SR 4 Eastbound Ramp (Intersection #4) would occur with implementation of Phase 1 of the proposed project, and would worsen with implementation of Phase 2 of the proposed project. Therefore, a ***significant*** impact would occur.

Mitigation Measure(s)

Implementation of the following mitigation measures would improve operations at the Deer Valley Road/Balfour Road intersection (Intersection #21) and the Hillcrest Avenue/SR 4 Eastbound Ramp (Intersection #4) to acceptable LOS. While the mitigation measures would be implemented during Phase 1 of the proposed project, implementation of the following mitigation measures would reduce potential impacts from Phases 2 and 3 of the proposed project as well. Although the intersection of Hillcrest Avenue/SR 4 Eastbound Ramps is located within the City of Antioch, Caltrans maintains jurisdiction over the intersection; additionally, jurisdiction over the intersection of Balfour Road/Deer Valley Road is shared by the City of Antioch and the City of Brentwood. Because the City does not have full jurisdiction over the intersections of Hillcrest Avenue/SR 4 Eastbound Ramps and Balfour Road/Deer Valley Road, completion of the proposed improvements cannot be guaranteed. As such, the impact to the Hillcrest Avenue/SR 4 Eastbound Ramp intersection would remain *significant and unavoidable*.

Multi-Generational Plan and Traditional Plan

4.12-2(a) Prior to issuance of building permits for Phase 1 of the proposed project, the project applicant shall fund installation of Adaptive Signal Control Technologies or other traffic signal interconnect systems approved by the City at the following intersections:

- *Slatten Ranch Road at SR 4 Westbound Ramps;*
- *Slatten Ranch Road/Sunset Drive at Hillcrest Avenue;*
- *Hillcrest Avenue at SR 4 Eastbound Ramps; and*
- *East Tregallas Road/Larkspur Drive at Hillcrest Avenue.*

The applicant shall fund the installation of Adaptive Signal Control Technologies or other traffic signal interconnect systems, and the City shall implement such systems in compliance with all relevant guidance from the

U.S. Department of Transportation Federal Highway Administration, Caltrans, and the City, as applicable.

4.12-2(b) Prior to issuance of building permits for Phase 1 of the proposed project, the project applicant shall pay regional transportation impact fees to the East Contra Costa Regional Fee and Financing Authority (ECCRFFA).

4.12-2(c) Prior to issuance of building permits for Phase 1 of the proposed project, the project applicant shall pay its fair share to the City towards the signalization of the Deer Valley Road/Balfour Road intersection in conjunction with other planned improvements, which include the construction of a southbound left-turn lane, as well as separate westbound left and right-turn lanes.

4.12-3 Study freeway facilities under the Existing Plus Project Condition. Based on the analysis below and the lack of feasible mitigation, the impact is *significant and unavoidable.*

Average daily trip generation, as well as roadway configurations, would be similar under both the Multi-Generational Plan and the Traditional Plan for the Existing Plus Project Condition. As such, potential impacts from both scenarios are considered below.

Multi-Generational Plan and Traditional Plan

In order to evaluate project impacts on study freeway facilities, project-generated traffic was added to existing traffic volumes on the mainline segments from south of Balfour Road to west of Lone Tree Way/A Street. The traffic volumes and number of travel lanes were used to calculate vehicle speeds using the HCM 2010 method. Vehicle speeds were subsequently used to calculate the delay index at each study freeway segment. The volume and delay index associated with each freeway segment are summarized in Table 4.12-7 and Table 4.12-8 below for the AM and PM peak hours, respectively.

As shown in the tables, the portion of SR 4 between Balfour Road and Sand Creek Road, with a delay index between 2.81 and 4.31 during the morning and evening peak hours, would continue to exceed the MTSO established by the CCTA in the East County Action Plan. However, the proposed project is not projected to add traffic to the freeway segment between Balfour Road and Sand Creek Road, because the travel route to and from the project site to SR 4 south is shorter by way of Deer Valley Road to Balfour Road than by way of Deer Valley Road to Lone Tree Way. Furthermore, as noted previously, SR 4 is currently being widened to improve operations at the aforementioned segment. The project would contribute fair-share funding to the improvements through required payment of the regional transportation impact fees to the ECCRFFA. All other freeway segments would continue to operate within the established MTSO (delay index of less than 2.5 during either the AM or PM peak period) under the Existing Plus Project Condition.

Table 4.12-7
Existing Plus Project Freeway Conditions – AM Peak Hour

Segment	Direction	Existing		Existing Plus Project (Multi-Generational)		Existing Plus Project (Traditional)	
		Volume	Delay Index	Volume	Delay Index	Volume	Delay Index
1. SR 4, west of Lone Tree Way/A Street	EB	2,966	1.00	3,026	1.00	3,034	1.00
	WB	3,837	1.00	3,998	1.00	4,031	1.00
2. SR 4, west of Hillcrest Avenue	EB	2,580	1.00	2,596	1.00	2,598	1.00
	WB	3,166	1.00	3,166	1.00	3,166	1.00
3. SR 4, west of State Route 160	EB	2,128	1.00	2,141	1.00	2,144	1.00
	WB	2,500	1.00	2,505	1.00	2,506	1.00
4. SR 4, west of Laurel Road	EB	2,412	1.00	2,417	1.00	2,418	1.00
	WB	3,108	1.00	3,121	1.00	3,124	1.00
5. SR 4, north of Lone Tree Way	SB	2,456	1.00	2,461	1.00	2,462	1.00
	NB	2,699	1.01	2,712	1.01	2,715	1.01
6. SR 4, north of Sand Creek Road	SB	2,151	1.00	2,194	1.00	2,203	1.00
	NB	2,382	1.00	2,399	1.00	2,401	1.00
7. SR 4, north of Balfour Road	SB	1,342	1.49	1,342	1.49	1,342	1.49
	NB	**1,580**	**2.81**	**1,580**	**2.81**	**1,580**	**2.81**
8. SR 4, south of Balfour Road	SB	992	1.04	1,072	1.04	1,089	1.08
	NB	730	1.00	761	1.00	764	1.01
9. State Route 160, north of SR 4	NB	1,284	1.00	1,310	1.00	1,316	1.00
	SB	960	1.00	970	1.00	972	1.00

Notes:
- EB = Eastbound; WB = Westbound; NB = Northbound; and SB = Southbound.
- Facilities that would operate below acceptable levels are shown in **BOLD**.

Source: Fehr & Peers, 2018.

Table 4.12-8
Existing Plus Project Freeway Conditions – PM Peak Hour

Segment	Direction	Existing		Existing Plus Project (Multi-Generational)		Existing Plus Project (Traditional)	
		Volume	Delay Index	Volume	Delay Index	Volume	Delay Index
1. SR 4, west of Lone Tree Way/A Street	EB	5,892	1.06	6,079	1.07	6,117	1.08
	WB	4,122	1.00	4,254	1.00	4,279	1.00
2. SR 4, west of Hillcrest Avenue	EB	5,187	1.02	5,236	1.02	5,246	1.02
	WB	3,583	1.00	3,603	1.00	3,603	1.00
3. SR 4, west of State Route 160	EB	4,132	1.00	4,141	1.00	4,143	1.00
	WB	3,186	1.00	3,201	1.00	3,204	1.00
4. SR 4, west of Laurel Road	EB	4,110	1.01	4,125	1.01	4,128	1.01
	WB	2,637	1.00	2,646	1.00	2,648	1.00
5. SR 4, north of Lone Tree Way	SB	3,480	1.07	3,495	1.07	3,498	1.07
	NB	2,670	1.01	2,679	1.01	2,681	1.01
6. SR 4, north of Sand Creek Road	SB	2,748	1.01	2,781	1.01	2,787	1.01
	NB	2,476	1.00	2,528	1.01	2,538	1.01
7. SR 4, north of Balfour Road	SB	1,399	1.68	1,399	1.68	1,399	1.68
	NB	**1,704**	**4.31**	**1,704**	**4.31**	**1,704**	**4.31**
8. SR 4, south of Balfour Road	SB	782	1.01	840	1.01	850	1.01
	NB	1,115	1.11	1,209	1.21	1,227	1.24
9. State Route 160, north of SR 4	NB	1,143	1.00	1,161	1.00	1,165	1.00
	SB	1,670	1.00	1,700	1.00	1,706	1.00

Notes:
- EB = Eastbound; WB = Westbound; NB = Northbound; and SB = Southbound.
- Facilities that would operate below acceptable levels are shown in **BOLD**.

Source: Fehr & Peers, 2018.

The TIA included an evaluation of vehicle traffic in HOV lanes on SR 4. As shown in Table 4.12-9, under the Existing Condition, the volume of traffic in the HOV lane exceeds the desired MTSO HOV standard of 600 vehicles per hour for eastbound SR 4 from west of Lone Tree Way/A Street to the HOV lane terminus near Hillcrest Avenue. The proposed project is expected to add traffic (up to 29 vehicles in the PM peak hour) to the HOV lane segment, worsening the existing deficiency.

Table 4.12-9
Existing Plus Project Freeway HOV Lane Volumes

Segment	Direction	Existing		Existing Plus Project (Multi-Generational)		Existing Plus Project (Traditional)	
		AM	PM	AM	PM	AM	PM
1. SR 4, west of Lone Tree Way/A St.	EB	--	**766**	--	**790**	--	**795**
	WB	499	--	520	--	524	--
2. SR 4, west of Hillcrest Ave.	EB	--	**674**	--	**681**	--	**682**
	WB	412	--	412	--	412	--

Notes:
- EB = Eastbound; WB = Westbound
- **Bold** indicates HOV lane volume exceeds desired volume of 600 vehicles per hour

Source: Fehr & Peers, 2018.

Based on the above, under the Existing Plus Project Condition, the proposed project would not conflict with the established delay index threshold of 2.5 during either the AM or PM peak hour periods. However, the proposed project would result in conflicts with the established MTSO for HOV lane utilization at SR 4 west of Lone Tree Way/A Street and SR 4 west of Hillcrest Avenue. Thus, a ***significant*** impact to study freeway facilities could occur.

Mitigation Measure(s)

The portions of SR 4 west of SR 160 have been constructed to the planned ultimate right-of-way, and additional freeway improvements have not been proposed. Payment of regional transportation impact fees to the ECCRFFA would ensure the project contributes a fair share to regional congestion management programs. However, feasible mitigation does not exist to improve operations such that the HOV lane utilization at the impacted freeway segments would be reduced to below the established MTSO. Thus, the impact would be *significant and unavoidable.*

Multi-Generational and Traditional Plan

4.12-3 Implement Mitigation Measure 4.12-2(b).

4.12-4 Study intersections under the Near-Term Plus Project Condition. Based on the analysis below, even with mitigation, the impact is *significant and unavoidable*.

Average daily trip generation, as well as roadway configurations, would be similar under both the Multi-Generational Plan and the Traditional Plan for the Near-Term Plus Project Condition. As such, potential impacts from both scenarios are considered below.

Multi-Generational Plan and Traditional Plan

For the Near-Term Condition, the following improvements are conditioned on near-term developments and considered in near-term forecasts: extension of Hillcrest Avenue from its current terminus to an extension of Sand Creek Road; improvements to Heidorn Ranch Road; extension of Sand Creek Road from SR 4 in the east to the roadway's current terminus by the Kaiser Medical Center; extension of Laurel Road from SR 4 to the roadway's current terminus east of Canada Valley Road; and completion of the SR 4 at Balfour Road interchange improvements, which are currently under construction. In addition, Lone Tree Way is planned to be restriped to provide three through lanes in both the eastbound and westbound directions from west of Deer Valley Road to Hillcrest Avenue. At the Lone Tree Way/Deer Valley Road intersection, the third westbound through lane would become a second westbound left-turn lane.

As part of the proposed project, roadway improvements would be constructed to extend Sand Creek Road from Deer Valley Road to Dallas Ranch Road, and Deer Valley Road would be improved along the project frontage to provide two travel lanes in each direction through the Sand Creek Road intersection, where Deer Valley Road would taper to a two-lane cross-section.

The Near-Term Condition evaluates the Existing Conditions with the addition of traffic from reasonably foreseeable projects in the area, including traffic from the approved projects list include in Table 4.12-5. The analysis results are presented in Table 4.12-10. As shown in the table, the following intersections would operate at a substandard LOS in the Near-Term Condition without the addition of project traffic:

- Hillcrest Avenue/SR 4 Eastbound Ramp (Intersection #4) (LOS F, AM and PM peak hour);
- Lone Tree Way/SR 4 Eastbound Ramp (Intersection #11) (LOS E, PM peak hour); and
- Balfour Road/Deer Valley Road (Intersection #21) (LOS F, AM peak hour).

With the addition of project traffic, operations at the three foregoing intersections would worsen. In addition, operations of the Deer Valley Road and Prewett Ranch Drive intersection (Intersection #14) would degrade to LOS E in the AM peak hour with the Multi-Generational Plan and Traditional Plan. Peak signal warrants would continue to be met at the Balfour Road/Deer Valley Road intersection. All other study intersections would operate at acceptable service levels with the addition of project traffic.

Table 4.12-10
Near-Term Plus Project Condition Intersection LOS

Intersection	Control[1]	Peak Hour	Near-Term Without Project		Near-Term Plus Project (Multi-Generational)		Near-Term Plus Project (Traditional)	
			Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS
1. Lone Tree Way/A Street/SR 4 Westbound Ramps	Signal	AM	17	B	21	C	22	C
		PM	13	B	14	B	14	B
2. Lone Tree Way/A Street/SR 4 Eastbound Ramps	Signal	AM	19	B	23	C	23	C
		PM	24	C	30	C	31	C
3. Hillcrest Avenue/ SR4 Westbound Ramps	Signal	AM	17	B	17	B	17	B
		PM	23	C	24	C	24	C
4. Hillcrest Avenue/Sunset Drive/SR4 Eastbound Ramps	Signal	AM	**87**	**F**	**91**	**F**	**92**	**F**
		PM	**121**	**F**	**126**	**F**	**128**	**F**
5. Lone Tree Way/Davison Drive	Signal	AM	22	C	26	C	27	C
		PM	22	C	24	C	25	C
6. Deer Valley Road/Hillcrest Avenue/Davison Drive	Signal	AM	36	D	37	D	38	D
		PM	50	D	51	D	51	D
7. Lone Tree Way/James Donlon Boulevard	Signal	AM	24	C	26	C	26	C
		PM	22	C	25	C	26	C
8. Lone Tree Way/Dallas Ranch Road	Signal	AM	39	D	48	D	50	D
		PM	30	C	36	D	37	D
9. Lone Tree Way/Deer Valley Road	Signal	AM	41	D	46	D	47	D
		PM	35	C	41	D	42	D
10. Lone Tree Way/Hillcrest Avenue	Signal	AM	26	C	27	C	27	C
		PM	28	C	29	C	30	C
11. Lone Tree Way/SR 4 Eastbound Ramps	Signal	AM	19	B	20	B	20	B
		PM	**62**	**E**	**64**	**E**	**64**	**E**
12. Lone Tree Way/SR 4 Westbound Ramps/Jeffery Way	Signal	AM	12	B	13	B	13	B
		PM	27	C	24	C	24	C
13. Prewett Ranch Drive/Dallas Ranch Road	Signal	AM	19	B	21	C	21	C
		PM	14	B	14	B	14	B
14. Prewett Ranch Drive/Deer Valley Road	Signal	AM	40	D	**62**	**E**	**67**	**E**
		PM	23	C	43	D	51	D

(Continued on next page)

Table 4.12-10
Near-Term Plus Project Condition Intersection LOS

Intersection	Control[1]	Peak Hour	Near-Term Without Project		Near-Term Plus Project (Multi-Generational)		Near-Term Plus Project (Traditional)	
			Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS
15. Deer Valley Road/Wellness Way/Street A	Signal	AM	6	A	28	C	39	D
		PM	8	A	21	C	23	C
16. Sand Creek Road/Deer Valley Road	Signal	AM	13	B	18	B	19	B
		PM	14	B	19	B	19	B
17. Sand Creek Road/Hillcrest Avenue (future)	Signal	AM	28	C	28	C	29	C
		PM	22	C	22	C	23	C
18. Sand Creek Road/Heidorn Ranch Road (future)	Signal	AM	16	B	17	B	17	B
		PM	14	B	15	B	15	B
19. Sand Creek Road/SR 4 Eastbound Ramps	Signal	AM	16	B	20	B	20	B
		PM	37	D	45	D	46	D
20. Sand Creek Road/SR 4 Westbound Ramps	Signal	AM	6	A	6	A	6	A
		PM	7	A	8	A	8	A
21. Balfour Road/Deer Valley Road	SSSC	AM	**38 (72)**	**E (F)**	**83 (>120)**	**F (F)**	**93 (>120)**	**F (F)**
		PM	8 (15)	A (B)	11 (20)	B (C)	11 (21)	B (C)
22. Balfour Road/SR 4[3] Eastbound Ramps	Signal	AM	13	B	14	B	16	B
		PM	17	B	18	B	19	B
23. Balfour Road/SR 4 Westbound Ramps	Signal	AM	11	B	11	B	11	B
		PM	12	B	12	B	13	B
24. Slatten Ranch/SR 4 Westbound Ramps	Signal	AM	12	B	12	B	12	B
		PM	13	B	14	B	14	B

Notes:
Facilities that would operate below acceptable levels are shown in **BOLD**.
[1] Signal = signalized intersection
[2] Average intersection delay is calculated for all signalized intersections using the HCM method for vehicles.
[3] Analyzed as an at-grade intersection in the Existing Condition and Balfour Road/SR 4 Eastbound Ramps in Near-Term and Cumulative Conditions.

Source: Fehr & Peers, 2018.

Based on the above, full development of the proposed project could conflict with City of Antioch's established LOS standards at the Hillcrest Avenue/ SR 4 Eastbound Ramp intersection, the Lone Tree Way/SR 4 Eastbound Ramp intersection, the Sand Creek Road/SR 4 Eastbound Ramp intersection, the Balfour Road/Deer Valley Road intersection, and the Prewett Ranch Drive and Deer Valley Road intersection under the Near-Term Plus Project Condition.

The foregoing impacts to intersection operations at Hillcrest Avenue/SR 4 Eastbound Ramp (Intersection #4), Lone Tree Way/SR 4 Eastbound Ramp (Intersection #11), and Balfour Road/Deer Valley Road (Intersection #21) would occur with implementation of Phase 1 of the proposed project. Impacts at Hillcrest Avenue/SR 4 Eastbound Ramp (Intersection #4), Lone Tree Way/SR 4 Eastbound Ramp (Intersection #11), and Balfour Road/Deer Valley Road (Intersection #21) would worsen with implementation of Phase 2 of the proposed project, and implementation of Phase 2 would result in the identified impact to Prewett Ranch Drive/Deer Valley Road (Intersection #14).

Considering the above, a ***significant*** impact could occur.

Mitigation Measure(s)

Table 4.12-11 shows the LOS at the impacted intersections in the Near-Term Plus Project Condition both with and without mitigation. As shown in the table, all intersections would operate acceptably (LOS D or better) with the mitigation. It should be noted that implementation of Mitigation Measure 4.12-4(c), which would reduce impacts to Prewett Ranch Drive/Deer Valley Road intersection, would result in the extension of Sand Creek Road between Deer Valley Road and the currently planned terminus at the Dozier-Libby Medical High School, which would result in a shift in traffic patterns. As shown in Table 4.12-11, such a shift in traffic patterns in the project area would degrade LOS at the intersection of Sand Creek Road/SR 4 Eastbound Ramp from an acceptable LOS to an unacceptable LOS E under the Multi-Generational Plan and LOS F under the Traditional Plan. Therefore, Mitigation Measure 4.12(d) has been included in this EIR to ensure that operation of Sand Creek Road/SR 4 Eastbound Ramp intersection would operate acceptably. However, given that the intersection of Lone Tree Way/SR 4 Eastbound Ramp is under the jurisdiction of Caltrans, and that jurisdiction over the intersection of Balfour Road/Deer Valley Road is shared by the City of Antioch and the City of Brentwood, completion of the required improvements cannot be guaranteed solely by the City of Antioch. As such, the impact to the Lone Tree Way/SR 4 Eastbound Ramp and Balfour Road/Deer Valley Road intersections would be *significant and unavoidable*.

Table 4.12-11
Near-Term Plus Project Condition Intersection LOS – With Mitigation

Intersection	Control[1]	Peak Hour	Near-Term Without Project		Near-Term Plus Project With Mitigation (Multi-Generational)		Near-Term Plus Project With Mitigation (Traditional)	
			Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS
4. Hillcrest Avenue/SR 4 Eastbound Ramps	Signal	AM	**87**	**F**	**73**	**E**	**73**	**E**
		PM	**121**	**F**	**95**	**F**	**97**	**F**
11. Lone Tree Way/SR 4 Eastbound Ramps	Signal	AM	19	B	13	B	13	B
		PM	**62**	**E**	27	C	27	C
14. Prewett Ranch Drive/Deer Valley Road	Signal	AM	40	D	40	D	41	D
		PM	23	C	21	C	32	C
19. Sand Creek Road/SR 4 Eastbound Ramps [with implementation of Mitigation Measures 4.12-4(c)]	Signal	AM	17	B	22	C	23	C
		PM	36	D	**74**	**E**	**81**	**F**
19. Sand Creek Road/SR 4 Eastbound Ramps [with implementation of Mitigation Measures 4.12-4(c) and 4.12-4(d)]	Signal	AM	17	B	11	B	11	B
		PM	36	D	17	B	19	B
21. Balfour Road/Deer Valley Road	SSSC	AM	**38 (72)**	**E (F)**	28	C	28	C
		PM	8 (15)	A (B)	30	C	30	C

Notes:
Facilities that would operate below acceptable levels are shown in **BOLD**.
[1] Signal = signalized intersection
[2] Average intersection delay is calculated for all signalized intersections using the HCM method for vehicles.

Source: Fehr & Peers, 2018.

Multi-Generational Plan and Traditional Plan

4.12-4(a) Implement Mitigation Measure 4.12-2(a).

4.12-4(b) Prior to issuance of building permits for Phase 1 of the proposed project, the project applicant shall contribute their fair share to intersection improvements at the Lone Tree Way/SR 4 Eastbound Ramp intersection that would result in acceptable operations, including widening the southbound off-ramp to provide a second right-turn only lane. In addition, traffic signals at the intersection shall be retimed. Given that widening of the southbound off-ramp could result in secondary impacts to pedestrians by increasing the pedestrian crossing distance, the potential secondary impact to pedestrians for all hours of the day shall be balanced against an intersection modification to improve vehicle travel during peak time periods. It should be noted that although the Lone Tree Way/SR 4 Eastbound Ramp intersection is located within the City of Antioch, the intersection is under the jurisdiction of Caltrans.

4.12-4(c) Prior to issuance of building permits for Phase 2 of the proposed project, the project applicant shall construct the Sand Creek Road extension between Deer Valley Road and the currently planned terminus at the Dozier-Libbey Medical High School. Completion of the extension would shift traffic from the Prewett Ranch Drive/Deer Valley Road intersection, resulting in acceptable operations at the intersection.

4.12-4(d) Prior to issuance of building permits for Phase 3 of the proposed project, the project applicant shall pay regional transportation impact fees to the ECCRFFA that would fund construction of additional improvements at the Sand Creek Road/SR 4 Eastbound Ramps interchange, which includes a slip-ramp for the eastbound Sand Creek to southbound SR 4 movement and eliminating the conflicting left-turn movement at the intersection. Proof of payment shall be submitted to the City of Antioch Community Development Department.

4.12-4(e) Implement Mitigation Measure 4.12-2(c) (Balfour Road/Deer Valley Road).

4.12-5 Study freeway facilities under Near-Term Plus Project Conditions. Based on the analysis below and the lack of feasible mitigation, the impact is *significant and unavoidable.*

Average daily trip generation, as well as roadway configurations, would be similar under both the Multi-Generational Plan and the Traditional Plan for the Near-Term Plus Project Condition. As such, potential impacts from both scenarios are considered below.

Multi-Generational Plan and Traditional Plan

Near-term freeway forecasts were developed based on the same method used to develop the near-term intersection forecasts, both without and with traffic from the proposed project. As noted previously, the Near-Term Plus Project Condition considers the completion of the Balfour Road interchange and the widening of SR 4 to provide two travel lanes in each direction from south of Sand Creek Road to south of Balfour Road. The volume and delay index associated with each freeway segment are summarized in Table 4.12-12 and Table 4.12-13 below for the AM and PM peak hours, respectively, based on the estimates of Near-Term Condition traffic volumes plus estimates of project traffic. As shown in the tables, none of the study freeway segments would exceed the established delay index threshold of 2.5 during either the AM or PM peak hour periods.

The TIA included an evaluation of vehicle traffic in HOV lanes on SR 4. As shown in Table 4.12-14, under the Near-Term Condition, the volume of traffic in the HOV lane would exceed the desired MTSO HOV standard of 600 vehicles per hour for eastbound SR 4 from west of Lone Tree Way/A Street to the HOV lane terminus near Hillcrest Avenue. The project is expected to add traffic to the HOV lane segment, worsening a near-term deficiency. In addition, the addition of project traffic could cause the MTSO for HOV lanes in the westbound direction during the morning peak hour to exceed the threshold.

Based on the above, under the Near-Term Plus Project Condition, none of the study freeway segments would exceed the established delay index threshold of 2.5 during either the AM or PM peak hour periods. However, the proposed project would result in conflicts with the established MTSO for HOV lane utilization at SR 4 west of Lone Tree Way/A Street and SR 4 west of Hillcrest Avenue. Thus, a ***significant*** impact to study freeway facilities could occur.

Mitigation Measure(s)

The portions of SR 4 west of SR 160 have been constructed to the planned ultimate right-of-way, and additional freeway improvements have not been proposed. The CCTA has developed the SR 4 Integrated Corridor Management Plan, which includes strategies such as adaptive ramp metering, incident management, traffic and transit information systems, traffic arterial and transit information systems, connected vehicle technologies, and integration with the Interstate 80 corridor ICM to better manage traffic flows along the corridor. Payment of ECCRFFA fees provides funding for the SR 4 Integrated Corridor Management Plan and the related improvements. However, given the absence of planned freeway improvements, even with the payment of ECCRFFA fees, feasible mitigation does not exist to improve operations such that the HOV lane utilization at the impacted freeway segments would be reduced to below the established MTSO, and the impact would remain *significant and unavoidable.*

Multi-Generational and Traditional Plan

4.12-5 Implement Mitigation Measure 4.12-2(b).

Table 4.12-12
Near-Term Plus Project Freeway Conditions – AM Peak Hour

Segment	Direction	Near-Term		Near-Term Plus Project (Multi-Generational)		Near-Term Plus Project (Traditional)	
		Volume	Delay Index	Volume	Delay Index	Volume	Delay Index
1. SR 4, west of Lone Tree Way/A Street	EB	3,469	1.00	3,534	1.00	3,536	1.00
	WB	4,499	1.01	4,684	1.01	4,693	1.01
2. SR 4, west of Hillcrest Avenue	EB	3,051	1.00	3,077	1.00	3,077	1.00
	WB	3,618	1.00	3,660	1.00	3,662	1.00
3. SR 4, west of State Route 160	EB	2,559	1.00	2,595	1.00	2,597	1.00
	WB	3,168	1.00	3,215	1.00	3,217	1.00
4. SR 4, west of Laurel Road	EB	2,754	1.00	2,765	1.00	2,766	1.00
	WB	3,875	1.01	3,891	1.01	3,894	1.01
5. SR 4, north of Lone Tree Way	SB	2,832	1.01	2,843	1.01	2,844	1.01
	NB	3,360	1.05	3,376	1.05	3,379	1.05
6. SR 4, north of Sand Creek Road	SB	2,458	1.00	2,469	1.00	2,470	1.00
	NB	2,928	1.02	2,944	1.02	2,947	1.02
7. SR 4, north of Balfour Road	SB	1,805	1.00	1,837	1.00	1,843	1.00
	NB	1,934	1.00	1,943	1.00	1,944	1.00
8. SR 4, south of Balfour Road	SB	1,397	1.67	1,477	2.05	1,494	2.15
	NB	968	1.04	999	1.00	1,002	1.00
9. State Route 160, north of SR 4	NB	1,550	1.00	1,580	1.00	1,582	1.00
	SB	1,038	1.00	1,095	1.00	1,095	1.00

Notes: EB = Eastbound; WB = Westbound; NB = Northbound; and SB = Southbound.

Source: Fehr & Peers, 2018.

Table 4.12-13
Near-Term Plus Project Freeway Conditions – PM Peak Hour

Segment	Direction	Near-Term		Near-Term Plus Project (Multi-Generational)		Near-Term Plus Project (Traditional)	
		Volume	Delay Index	Volume	Delay Index	Volume	Delay Index
1. SR 4, west of Lone Tree Way/A Street	EB	6,635	1.15	6,813	1.18	6,851	1.19
	WB	4,720	1.00	4,823	1.00	4,846	1.00
2. SR 4, west of Hillcrest Avenue	EB	5,767	1.05	5,825	1.05	5,838	1.05
	WB	4,067	1.00	4,068	1.00	4,069	1.00
3. SR 4, west of State Route 160	EB	4,921	1.00	4,948	1.00	4,954	1.00
	WB	3,643	1.00	3,659	1.00	3,663	1.00
4. SR 4, west of Laurel Road	EB	5,003	1.05	5,036	1.05	5,043	1.05
	WB	3,133	1.00	3,143	1.00	3,146	1.00
5. SR 4, north of Lone Tree Way	SB	4,207	1.30	4,220	1.31	4,247	1.32
	NB	3,233	1.04	3,243	1.04	3,246	1.04
6. SR 4, north of Sand Creek Road	SB	3,318	1.04	3,351	1.05	3,358	1.05
	NB	2,954	1.02	2,964	1.02	2,967	1.02
7. SR 4, north of Balfour Road	SB	1,916	1.00	1,937	1.00	1,941	1.00
	NB	2,279	1.00	2,306	1.00	2,311	1.00
8. SR 4, south of Balfour Road	SB	1,146	1.14	1,204	1.21	1,214	1.22
	NB	1,594	1.03	1,688	1.05	1,706	1.06
9. State Route 160, north of SR 4	NB	1,267	1.00	1,285	1.00	1,289	1.00
	SB	1,859	1.00	1,889	1.00	1,895	1.00

Notes: EB = Eastbound; WB = Westbound; NB = Northbound; and SB = Southbound.

Source: Fehr & Peers, 2018.

Table 4.12-14
Near-Term Plus Project Freeway HOV Lane Volumes

Segment	Direction	Near-Term		Near-Term Plus Project (Multi-Generational)		Near-Term Plus Project (Traditional)	
		AM	PM	AM	PM	AM	PM
1. SR 4, west of Lone Tree Way/A St.	EB	--	**863**	--	**886**	--	**891**
	WB	585	--	**609**	--	**610**	--
2. SR 4, west of Hillcrest Ave.	EB	--	**750**	--	**757**	--	**759**
	WB	470	--	476	--	476	--

Notes:
- EB = Eastbound; WB = Westbound
- **Bold** indicates HOV lane volume exceeds desired volume of 600 vehicles per hour

Source: Fehr & Peers, 2018.

4.12-6 Would the project substantially increase traffic hazards due to a design feature (e.g. sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment), or result in inadequate emergency access. Based on the analysis below and with implementation of mitigation, the impact is *less than significant.*

Multi-Generational and Traditional Plan

As discussed previously, the proposed project would include construction of an arterial roadway (Sand Creek Road) that would connect the existing terminus of Dallas Ranch Road on the northwestern portion of the proposed project site to the existing terminus of Sand Creek Road at Deer Valley Road, immediately south of the Kaiser Permanente Antioch Medical Center. The on-site Sand Creek Road extension would ultimately be constructed as a four lane arterial at full buildout. The connections at Dallas Ranch Road and Deer Valley Road would provide the primary access points to the project site.

A detailed overview of the proposed circulation system improvements associated with the Multi-Generational and Traditional Plans is included in Chapter 3, Project Description, of this EIR.

Site Access and Circulation

According to the TIA prepared for the proposed project, most on-site intersections are projected to carry low volumes of traffic and would operate acceptably with side-street or all-way traffic control. Analysis was conducted for the three primary internal intersections under a variety of traffic control options, including stop-control (either side-street or all-way), traffic signal, or roundabout. Sand Creek Road within the project site was evaluated as both a two-lane roadway (see Table 4.12-15) and a four-lane roadway (see Table 4.12-16).

Table 4.12-15
Cumulative Plus Project Condition Internal Intersection LOS: Two-Lane Sand Creek Road

Intersection	Peak Hour	Stop-Control		Roundabout		Traffic Signal	
		Delay	LOS	Delay	LOS	Delay	LOS
Sand Creek Road/B Street	AM	7 (20)	A (C)	7	A	21	C
	PM	9 (56)	A (F)	10	A	24	C
Sand Creek Road/A Street	AM	1 (16)	A (C)	Not Proposed		9	A
	PM	1 (21)	A (C)			11	B
B Street/C Street	AM	11	B	5	A	Not Proposed	
	PM	11	B	6	A		

Note: Delay is based on 2010 HCM method for vehicles.

Source: Fehr & Peers, 2018.

Table 4.12-16
Cumulative Plus Project Condition Internal Intersection LOS: Four-Lane Sand Creek Road

Intersection	Peak Hour	Stop-Control		Roundabout		Traffic Signal	
		Delay	LOS	Delay	LOS	Delay	LOS
Sand Creek Road/B Street	AM	6 (16)	A (C)	7	A	20	B
	PM	8 (47)	A (E)	8	A	22	C
Sand Creek Road/A Street	AM	1 (11)	A (B)	Not Proposed		8	A
	PM	1 (18)	A (C)			9	A
B Street/C Street	AM	11	A	5	A	Not Proposed	
	PM	11	B	6	A		

Note: Delay is based on 2010 HCM method for vehicles.

Source: Fehr & Peers, 2018.

As shown in the tables, Sand Creek Road would operate at acceptable service levels as either a two-lane or four-lane roadway, with major intersections roundabout control or signal control. Should parcels located to the south of the project site remain undeveloped, the traffic volumes on Sand Creek Road are not likely to warrant a four-lane cross-section.

Emergency Access

Several factors determine whether a project has sufficient access for emergency vehicles, including the following:

1. Number of access points (both public and emergency access only);
2. Width of access points; and
3. Width of internal roadways.

Based on the 2016 California Fire Code as amended by Contra Costa County Ordinance 2016-23, the following guidance is provided for access to residential developments:

> The minimum number of access roads serving residential development(s) shall be based upon the number of dwelling units served as follows:
>
> - Multiple Family Residential Projects having more than 100 dwelling units should be provided with two separated and approved fire apparatus access roads (D106.1).
> - Development of one or two-family dwellings where the number of dwelling units exceed 30 shall be provided with two separate and approved fire apparatus access roads; where there are more than 30-dwelling units on a single public or private fire apparatus access road and all dwelling units are equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, 903.3.1.2 or 903.3.1.3 of the *California Fire Code*, access from two directions shall not be required (D107.1)

Access to the project would be provided from new roadway connections from Deer Valley Road via Street A and an extension of Sand Creek Road connecting Deer Valley Road to Dallas Ranch Road. Access to the northern development areas would be provided by multiple access points along Street A and Sand Creek Road, which satisfies the California Fire Code (CFC) requirements and the Contra Costa County Fire Protection District Ordinance (D107.1). Within the southern development area, Street C would serve as the primary access point while Empire Mine Road is proposed as an additional point of emergency vehicle access (EVA), allowing for two access points. However, use of Empire Mine Road as an EVA is speculative at this time and may not be feasible in the future. The California Building Code (CBC) requires that all new residences and commercial buildings be constructed with automatic sprinkler systems. Therefore, while the use of Empire Mine Road as an EVA remains speculative, providing access to the southern development area within project site by way of Street C in combination with installation of approved automatic sprinkler systems would satisfy the CFC and the Contra Costa County Fire Protection District Ordinance (D107.1).

All proposed access points and internal roadways would provide a minimum of 20 feet of clearway (i.e., unobstructed by parked vehicles, landscaping, etc.). Thus, sufficient width would be provided for emergency vehicle access. Consistent with General Plan Policy 7.3.2.y, private streets that would accommodate more than 50 vehicles per hour in the peak hour or that are designed for on-street parking would be designed to public street standards. The design of other proposed private streets and the potential use of Empire Mine Road EVA would be subject to the review and approval of the City Engineer.

It should be noted that on September 22, 2015, the City of Antioch adopted an update to the City's Emergency Operations Plan.[5] The intent of the Plan is to effectively and efficiently organize and coordinate the City of Antioch's response to major emergencies. The development of the proposed project, including all proposed roadway improvements,

[5] City of Antioch. *2015/16 City of Antioch Emergency Operations Plan.* September 22, 2015.

would not conflict with any applicable provisions of the plan. As such, the project would be consistent with the City's emergency preparedness planning efforts.

Conclusion

Based on the above, the proposed internal intersections would operate acceptably under buildout of the project site, and traffic hazards due to design features or incompatible uses would not occur. Adequate emergency access would be provided for the northern portion of the site, and emergency access to the southern portion of the project site would be provided by Street C, with the potential for future use of Empire Mine Road as a second point of emergency access to the southern portion of the project site. In addition to the aforementioned emergency access points, structures within the project site would be equipped with approved automatic sprinkler systems, thus satisfying the requirements of the CFC and the Contra Costa County Fire Protection District Ordinance (D107.1), regardless of the use of Empire Mine Road for additional EVA. Consequently, a ***less-than-significant*** impact could occur.

Mitigation Measure(s)
None required.

4.12-7 Conflict with adopted policies, plans, or programs regarding public transit, bicycle or pedestrian facilities, or otherwise decrease the performance or safety of such facilities. Based on the analysis below, the impact is *less than significant.*

Project impacts related to public transit, bicycle facilities, and pedestrian facilities are discussed below. Given that both the Multi-Generational and Traditional Plans would include similar transit, bicycle, and pedestrian infrastructure, and increases in demand for existing facilities would be relatively similar, potential impacts from both scenarios are considered below.

Transit System: Multi-Generational Plan and Traditional Plan

Transit service is not currently provided in the area. However, eBART stations is under construction within the median of SR 4 at Hillcrest Avenue and an additional station may be constructed within the median of SR 4 between Lone Tree Way and Sand Creek Road, approximately 2.5 to four miles east of the project site. In addition, two bus stops would be located along the proposed Sand Creek Road extension, one next to the proposed Village Center area and the other next to the proposed fire station site. As such, the project would be consistent with General Plan Policy 7.5.2.g.

Although transit facilities would be provided on Sand Creek Road, neighborhoods in the southwestern portion of the site would be located more than a quarter-mile walk to a bus stop, reducing the potential for transit trips for residents of future residents in the southwestern portion of the site. Notwithstanding the distance between neighborhoods in the southwestern portion of the site to proposed bus stops, the proposed project includes extensive pedestrian facilities including sidewalks, trails, and pedestrian bridges, which

would facilitate access of residents in the southern portion of the project site to the proposed bus stops along Sand Creek Road. In addition, bus stops throughout the City are typically located within major roadways, such as the proposed Sand Creek Road extension. Provision of bus stops within the southern portion of the project site would require placement of bus stops within roadways intended for local inter-neighborhood travel, which would create a more circuitous route for transit. Thus, provision of bus stops along Sand Creek Road would provide transit access to the project site, and would be consistent with the placement of bus stops within the City.

Bicycle Facilities: Multi-Generational Plan and Traditional Plan

Class II bicycle lanes would be constructed on Sand Creek Road, Deer Valley Road, and Streets A, B and C. The on-street Class II bicycle facilities would be designed in accordance with the City of Antioch's Citywide Design Guidelines. In addition, the proposed project would include the construction of a seven-mile off-street trail system, ranging from a four-foot natural trail to asphalt trails with stabilized shoulders, designed per Contra Costa County Fire Protection District standards to accommodate emergency access. As part of the off-street trail system, a 10-foot wide pedestrian/bicycle bridge would be constructed across Sand Creek near the Homestead Park site. The proposed bicycle lanes included with the Sand Creek Road extension would connect to existing Class II bicycle lanes at Dallas Ranch Road. Deer Valley Road, to the east and south of the site, does not include bicycle lanes.

Pedestrian Facilities: Multi-Generational Plan and Traditional Plan

The proposed project would include arterial, collector, local and hillside roadways. Arterial roadways would provide a six-foot sidewalk on both sides of the street, except where a parallel Class I multi-use trail is provided. Collector and local roadways would provide a five-foot sidewalk on both sides of the street where development is proposed; if development would only occur on one side of the street, the sidewalk would be placed adjacent to development, with a Class I multi-use trail provided on the opposite side of the street. Sidewalks on the hillside roadways are proposed to be four-feet. The proposed sidewalk network would connect to the site to adjacent developments, providing continuous pedestrian connections in the area. Furthermore, as noted above, the project would include a seven-mile off-street trail system and a pedestrian/bicycle bridge across Sand Creek.

Conclusion

Given that the proposed project would include the construction of bus stops along the proposed Sand Creek Road extension, the project would be consistent with General Plan Policy.5.2.g related to public transit. Furthermore, as noted above, the proposed project would provide for pedestrian and bicycle facilities throughout the project site, and would include connections to existing facilities in the surrounding area. Thus, the proposed project would be consistent with General Plan Policies 7.4.2.a. through 7.4.2.p related to non-motorized transportation. Consequently, the project would not conflict with adopted

policies, plans, or programs regarding public transit, bicycle or pedestrian facilities, or otherwise decrease the performance or safety of such facilities, and a ***less-than-significant*** impact would occur.

Mitigation Measure(s)
None required.

Cumulative Impacts and Mitigation Measures

Cumulative impacts associated with study intersections and freeway segments are discussed in detail below.

4.12-8 Study intersections under the Cumulative Plus Project Condition. Based on the analysis below, even with mitigation, the cumulative impact would remain *significant and unavoidable*.

Average daily trip generation, as well as roadway configurations, would be similar under both the Multi-Generational Plan and the Traditional Plan for the Cumulative Plus Project Condition. As such, potential impacts from both scenarios are considered below.

Multi-Generational Plan and Traditional Plan

The Cumulative Condition includes cumulative volumes based on traffic growth trends as described in both the Antioch and Brentwood General Plan EIRs, and supplemented by a check of traffic forecasts for the study area in the most recent Contra Costa Transportation Authority Countywide travel demand model. The scenario reflects conditions over the next 20 to 25 years. The Cumulative Plus Project Condition is based on the Cumulative Condition plus the trips from the proposed project (Multi-Generational and Traditional Plans).

In addition to the roadway improvements considered in the analysis of the Near-Term scenarios, the Cumulative Condition includes the extension of Hillcrest Avenue to Balfour Road. Further upgrades to the Sand Creek Road/SR 4 interchange, as well as the SR 4 mainline, are currently planned, but not fully funded. Consequently, such upgrades were not included in the Cumulative Plus Project Condition.

The analysis results are presented in Table 4.12-17 below. As shown in the table, the following intersections six intersections would operate at a substandard LOS in the Cumulative Condition without the addition of project traffic:

- Hillcrest Avenue/ SR 4 Eastbound Ramps (Intersection #4) (LOS F AM and PM peak hour);
- Lone Tree Way/Hillcrest Avenue (Intersection #10) (LOS E, PM peak hour);
- Lone Tree Way/SR 4 Eastbound Ramp (Intersection #11) (LOS F, PM peak hour);

Table 4.12-17
Cumulative Plus Project Condition Intersection LOS

Intersection	Control[1]	Peak Hour	Cumulative Without Project		Cumulative Plus Project (Multi-Generational)		Cumulative Plus Project (Traditional)	
			Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS
1. Lone Tree Way/A Street/SR 4 Westbound Ramps	Signal	AM	26	C	33	C	34	C
		PM	16	B	19	B	19	B
2. Lone Tree Way/A Street/SR 4 Eastbound Ramps	Signal	AM	19	B	21	C	21	C
		PM	24	C	30	C	31	C
3. Hillcrest Avenue/Sunset Drive/Slatten Ranch Road	Signal	AM	21	C	21	C	21	C
		PM	22	C	22	C	22	C
4. Hillcrest Avenue/ SR4 Eastbound Ramps	Signal	AM	**108**	**F**	**111**	**F**	**112**	**F**
		PM	**> 150**	**F**	**> 150**	**F**	**> 150**	**F**
5. Lone Tree Way/Davison Drive	Signal	AM	51	D	**66**	**E**	**70**	**E**
		PM	24	C	26	C	27	C
6. Deer Valley Road/Hillcrest Avenue/Davison Drive	Signal	AM	43	D	44	D	44	D
		PM	44	D	44	D	44	D
7. Lone Tree Way/James Donlon Boulevard	Signal	AM	33	C	36	D	36	D
		PM	34	C	38	D	39	D
8. Lone Tree Way/Dallas Ranch Road	Signal	AM	42	D	52	D	53	D
		PM	29	C	34	C	36	D
9. Lone Tree Way/Deer Valley Road	Signal	AM	39	D	43	D	44	D
		PM	36	D	40	D	40	D
10. Lone Tree Way/Hillcrest Avenue	Signal	AM	50	D	52	D	52	D
		PM	**69**	**E**	**70**	**E**	**70**	**E**
11. Lone Tree Way/SR 4 Eastbound Ramps	Signal	AM	39	D	40	D	40	D
		PM	**85**	**F**	**85**	**F**	**85**	**F**
12. Lone Tree Way/SR 4 Westbound Ramps/Jeffery Way	Signal	AM	38	D	36	D	36	D
		PM	29	C	26	C	30	C
13. Prewett Ranch Drive/Dallas Ranch Road	Signal	AM	19	B	21	C	27	C
		PM	14	B	15	B	15	B
14. Prewett Ranch Drive/Deer Valley Road	Signal	AM	**65**	**E**	47	D	48	D
		PM	21	C	24	C	25	C

(Continued on next page)

Table 4.12-17
Cumulative Plus Project Condition Intersection LOS

Intersection	Control[1]	Peak Hour	Cumulative Without Project		Cumulative Plus Project (Multi-Generational)		Cumulative Plus Project (Traditional)	
			Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS
15. Deer Valley Road/Wellness Way/Street A	Signal	AM	13	B	25	C	31	C
		PM	9	A	21	C	21	C
16. Sand Creek Road/Deer Valley Road	Signal	AM	16	B	22	C	24	C
		PM	15	B	23	C	24	C
17. Sand Creek Road/Hillcrest Avenue (future)	Signal	AM	44	D	44	D	44	D
		PM	39	D	39	D	39	D
18. Sand Creek Road/Heidorn Ranch Road (future)	Signal	AM	24	C	25	C	25	C
		PM	24	C	27	C	28	C
19. Sand Creek Road/SR 4 Eastbound Ramps	Signal	AM	48	D	**63**	**E**	**65**	**E**
		PM	**>120**	**F**	**>120**	**F**	**>120**	**F**
20. Sand Creek Road/SR 4 Westbound Ramps	Signal	AM	16	B	16	B	16	B
		PM	26	C	29	C	29	C
21. Balfour Road/Deer Valley Road	SSSC	AM	**>120 (>120)**	**F (F)**	**>120 (>120)**	**F (F)**	**>120 (>120)**	**F (F)**
		PM	**33 (83)**	**D (F)**	**59 (>120)**	**F (F)**	**64 (>120)**	**F (F)**
22. Balfour Road/SR 4 Eastbound Ramps[3]	Signal	AM	29	C	30	C	30	C
		PM	38	D	39	D	39	D
23. Balfour Road/SR 4 Westbound Ramps	Signal	AM	17	B	17	B	17	B
		PM	16	B	16	B	16	B
24. Slatten Ranch/SR 4 Westbound Ramps	Signal	AM	21	C	21	C	21	C
		PM	14	B	15	B	15	B

Notes:
Facilities that would operate below acceptable levels are shown in **BOLD**.
[1] Signal = signalized intersection
[2] Average intersection delay is calculated for all signalized intersections using the HCM method for vehicles.
[3] Analyzed as an at-grade intersection in the Existing Condition and Balfour Road/SR 4 Eastbound Ramps in Near-Term and Cumulative Conditions.

Source: Fehr & Peers, 2018.

- Prewett Ranch Drive/Deer Valley Road (Intersection #14) (LOS E, AM peak Hour)
- Sand Creek Road/SR 4 Eastbound Ramps (Intersection #19) (LOS F, PM peak hour); and
- Balfour Road/Deer Valley Road (Intersection #21) (LOS F, AM peak hour).

With full buildout of the proposed project, and resulting addition of project traffic, operations at all six intersections would worsen. In addition, operations of the Lone Tree Way/Davison Drive intersection (Intersection #5) would degrade to LOS E in the AM peak hour for both the Multi-Generational Plan and the Traditional Plan. All other study intersection would operate at acceptable service levels with the addition of project traffic and the completion of associated roadway improvements.

Impacts to Intersections #4, #10, #11, #14, #19, and #21, would occur with implementation of Phase 1, while impacts to Intersection #5 would only occur following implementation of Phase 2 of the proposed project. It should be noted that as discussed in Method of Analysis section above, the cumulative setting for the proposed project includes anticipated future development consistent with current long-range planning within the City of Antioch and the City of Brentwood. Considering the long-term outlook of the cumulative scenario, some of the anticipated development may or may not be in place by the time Phase 1 or Phase 2 of the proposed project is implemented. If development within the project area does not occur to the full extent anticipated by the cumulative scenario, some of the foregoing impacts may not occur, or may occur at a later date than anticipated within the TIA. Nevertheless, the cumulative scenario provides an environmental worst-case analysis of potential impacts from buildout of the proposed project.

Based on the above, the proposed project could conflict with City of Antioch's established LOS standards at the seven aforementioned study intersections under the Cumulative Plus Project Condition. Therefore, a ***significant*** impact could occur.

Mitigation Measure(s)

Table 4.12-18 shows the LOS at the six impacted intersections in the Cumulative Plus Project Condition both with and without mitigation. As shown in the table, operations at the Lone Tree Way/Davidson Drive and Sand Creek Road/SR 4 Eastbound Ramp intersections would improve to acceptable (LOS D or better) operations with implementation of the mitigation below.

Even with mitigation to the Lone Tree Way/Hillcrest Avenue intersection, operations would remain unacceptable (LOS E). Nevertheless, the mitigation would improve operations over the Cumulative Condition operations. Thus, the impact to the three aforementioned intersections would be reduced to a less-than-significant level.

Table 4.12-18
Cumulative Plus Project Condition Intersection LOS – With Mitigation

Intersection	Control[1]	Peak Hour	Cumulative Without Project		Cumulative Plus Project with Mitigation (Multi-Generational)		Cumulative Plus Project with Mitigation(Traditional)	
			Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS
4. Hillcrest Avenue/SR4 Eastbound Ramps	Signal	AM	**108**	**F**	**90**	**F**	**103**	**F**
		PM	**287**	**E**	**182**	**E**	**184**	**F**
5. Lone Tree Way/Davison Drive	Signal	AM	51	D	48	D	51	D
		PM	24	C	24	C	25	C
10. Lone Tree Way/Hillcrest Avenue	Signal	AM	50	D	49	D	48	D
		PM	**69**	**E**	**58**	**E**	**59**	**E**
11. Lone Tree Way/SR 4 Eastbound Ramps	Signal	AM	39	D	18	B	13	B
		PM	**85**	**F**	28	D	28	C
19. Sand Creek Road/SR 4 Eastbound Ramps	Signal	AM	48	D	15	B	15	B
		PM	**>120**	**F**	36	D	37	D
21. Balfour Road/Deer Valley Road	SSSC	AM	**>120 (>120)**	**F (F)**	14	B	14	B
		PM	33 **(96)**	D **(F)**	18	B	21	C

Notes:
Facilities that would operate below acceptable levels are shown in **BOLD**.
[1] Signal = signalized intersection
[2] Average intersection delay is calculated for all signalized intersections using the HCM method for vehicles.

Source: Fehr & Peers, 2018.

However, the interchange at the Hillcrest Avenue/ SR4 Eastbound Ramps intersection has been built-out to the planned right-of-way, and additional improvements are not currently planned. Feasible mitigation does not exist to improve operations at the intersection. Furthermore, given that the intersection of Lone Tree Way/SR 4 Eastbound Ramp, is within the jurisdiction of Caltrans, and jurisdiction of the Balfour Road/Deer Valley Road intersection is shared by the City of Antioch and the City of Brentwood, both intersections are located outside of the City of Antioch's jurisdiction, and completion of the required improvements cannot be guaranteed. As such, the impacts to the following three study intersections would remain *significant and unavoidable*:

- Hillcrest Avenue/SR 4 Eastbound Ramps;
- Lone Tree Way/SR 4 Eastbound Ramp; and
- Balfour Road/Deer Valley Road.

The remaining three impacted intersections would operate acceptably (LOS D or better) with the implementation of the following mitigation measures.

Multi-Generational Plan and Traditional Plan

4.12-8(a) Implement Mitigation Measure 4.12-2(a) (Adaptive Signal Control Technologies).

4.12-8(b) Prior to issuance of building permits for the proposed project, the project applicant shall pay regional transportation impact fees to the ECCRFFA that would fund construction of additional improvements along the SR 4 corridor. Such improvements may improve operations at the Hillcrest Avenue/ SR 4 Eastbound Ramps intersection.

4.12-8(c) Prior to occupancy of the proposed buildings for Phase 2 of the proposed project, the project applicant shall restripe the westbound approach of the Lone Tree Way/Davidson Drive intersection to convert the westbound through lane to a left-thru shared lane. As the intersection currently operates with east-west split phasing, the traffic signal would not need to be modified.

4.12-8(d) Prior to issuance of building permits for Phase 1 of the proposed project, the project applicant shall modify the traffic signal at the intersection of Lone Tree Way/Hillcrest Avenue to provide a westbound right-turn overlap phase and a southbound right-turn overlap phase.

4.12-8(e) Implement Mitigation Measure 4.12-4(b) (Lone Tree Way/SR 4 Eastbound Ramps intersection).

4.12-8(f) Implement Mitigation Measure 4.12-4(d) (Sand Creek Road/SR 4 Eastbound Ramps intersection).

4.12-8(g) Implement Mitigation Measure 4.12-2(c) (Balfour Road/Deer Valley Road).

4.12-8(h) Prior to occupancy of the proposed buildings for Phase 1 of the proposed project, the project applicant shall construct the Sand Creek Road extension from Deer Valley Road to Dallas Ranch Road (one lane each way).

AlthoughAlthough implementation of Phase 1 of the proposed project in the cumulative scenario would be anticipated to result in impacts to Prewett Ranch Drive/Deer Valley Road, as discussed in Impact 4.12-2 and Impact 4.12-4, implementation of Phase 1 of the proposed project would not result in impacts to Prewett Ranch Drive/Deer Valley Road under either the existing conditions or the near-term conditions. Therefore, the potential impact to operations of Prewett Ranch Drive/Deer Valley Road would only occur in the cumulative setting, and, thus, implementation of Mitigation Measure 4.12-8(h) would only be required to reduce potential impacts of buildout of Phase 1 of the project in the cumulative condition.

4.12-9 Study freeway facilities under Cumulative Plus Project Conditions. Based on the analysis below and the lack of feasible mitigation, the impact is *significant and unavoidable.*

Average daily trip generation, as well as roadway configurations, would be similar under both the Multi-Generational Plan and the Traditional Plan for the Cumulative Plus Project Condition. As such, potential impacts from both scenarios are considered below.

Multi-Generational Plan and Traditional Plan

Cumulative freeway forecasts were developed based on the same method used to develop the cumulative intersection forecasts, both without and with traffic from the proposed project. The volume and delay index associated with each freeway segment are summarized in Table 4.12-19 and Table 4.12-20 below for the AM and PM peak hours, respectively, based on the estimates of Cumulative Condition traffic volumes plus estimates of project traffic. As shown in the tables, operations of Eastbound SR4 west of Lone Tree Way/A Street are projected to degrade beyond the MTSO with a projected delay index greater than 2.5 during the PM peak hour. Cumulative operation of the proposedproposed project would add approximately 204 vehicle trips during the AM peak hour and 236 vehicle trips to the PM peak hour to the portion of Eastbound SR 4 west of Lone Tree Way/A Street, which would worsen the delay index.

All other study freeway segments would continue to operate within the established MTSO (delay index of less than 2.5 during either the AM or PM peak period) under the Cumulative Plus Project Condition.

Table 4.12-19
Cumulative Plus Project Freeway Conditions – AM Peak Hour

Segment	Direction	Cumulative		Cumulative Plus Project (Multi-Generational)		Cumulative Plus Project (Traditional)	
		Volume	Delay Index	Volume	Delay Index	Volume	Delay Index
1. SR 4, west of Lone Tree Way/A Street	EB	4,820	1.00	4,881	1.00	4,887	1.00
	WB	5,470	1.03	5,631	1.04	5,664	1.04
2. SR 4, west of Hillcrest Avenue	EB	4,310	1.00	4,332	1.00	4,334	1.00
	WB	4,730	1.01	4,746	1.01	4,749	1.01
3. SR 4, west of State Route 160	EB	3,590	1.00	3,609	1.00	3,612	1.00
	WB	4,220	1.00	4,241	1.00	4,245	1.00
4. SR 4, west of Laurel Road	EB	3,880	1.01	3,891	1.01	3,166	1.00
	WB	5,080	1.05	5,109	1.06	5,115	1.06
5. SR 4, north of Lone Tree Way	SB	4,060	1.23	4,071	1.23	4,072	1.23
	NB	4,660	1.68	4,689	1.71	4,695	1.72
6. SR 4, north of Sand Creek Road	SB	3,470	1.06	3,481	1.07	3,482	1.07
	NB	4,120	1.25	4,149	1.27	4,155	1.27
7. SR 4, north of Balfour Road	SB	3,290	1.04	3,354	1.05	3,368	1.05
	NB	3,500	1.07	3,526	1.07	3,529	1.07
8. SR 4, south of Balfour Road	SB	2,510	1.00	2,590	1.01	2,607	1.01
	NB	2,520	1.00	2,551	1.01	2,554	1.01
9. State Route 160, north of SR 4	NB	1,710	1.00	1,736	1.00	1,742	1.00
	SB	1,140	1.00	1,150	1.00	1,152	1.00

Notes: EB = Eastbound; WB = Westbound; NB = Northbound; and SB = Southbound.

Source: Fehr & Peers, 2018.

Table 4.12-20
Cumulative Project Freeway Conditions – PM Peak Hour

Segment	Direction	Cumulative		Cumulative Plus Project (Multi-Generational)		Cumulative Plus Project (Traditional)	
		Volume	Delay Index	Volume	Delay Index	Volume	Delay Index
1. SR 4, west of Lone Tree Way/A Street	EB	**8,880**	**2.51**	**9,084**	**2.81**	**9,116**	**2.86**
	WB	6,240	1.03	6,501	1.04	6,526	1.04
2. SR 4, west of Hillcrest Avenue	EB	8,180	1.78	8,264	1.85	8,271	1.86
	WB	5,190	1.01	5,349	1.01	5,352	1.01
3. SR 4, west of State Route 160	EB	6,240	1.03	6,274	1.03	6,273	1.03
	WB	4,760	1.00	4,784	1.00	4,790	1.00
4. SR 4, west of Laurel Road	EB	6,220	1.27	6,260	1.28	6,260	1.28
	WB	4,090	1.01	4,108	1.01	4,113	1.01
5. SR 4, north of Lone Tree Way	SB	5,350	3.05	5,390	3.17	5,390	3.17
	NB	4,340	1.38	4,358	1.40	4,363	1.40
6. SR 4, north of Sand Creek Road	SB	4,810	1.87	4,850	1.93	4,850	1.93
	NB	3,740	1.12	3,758	1.12	3,763	1.12
7. SR 4, north of Balfour Road	SB	3,500	1.07	3,553	1.08	3,554	1.08
	NB	3,130	1.03	3,209	1.03	3,225	1.04
8. SR 4, south of Balfour Road	SB	2,220	1.00	2,278	1.00	2,288	1.00
	NB	2,630	1.01	2,723	1.01	2,742	1.01
9. State Route 160, north of SR 4	NB	1,390	1.00	1,408	1.00	1,412	1.00
	SB	2,040	1.00	2,070	1.00	2,076	1.00

Notes:
- EB = Eastbound; WB = Westbound; NB = Northbound; and SB = Southbound.
- Facilities that would operate below acceptable levels are shown in **BOLD**.

Source: Fehr & Peers, 2018.

The TIA included an evaluation of vehicle traffic in HOV lanes on SR 4. As shown in Table 4.12-21, under the Cumulative Condition, the volume of traffic in the HOV lane would exceed the established MTSO of 600 vehicles per hour for westbound and eastbound SR 4 in the project vicinity. The proposed project would add traffic of up to 31 more vehicles to HOV lane segments, worsening a cumulative deficiency.

Table 4.12-21
Cumulative Plus Project Freeway HOV Lane Volumes

Segment	Direction	Cumulative		Cumulative Plus Project (Multi-Generational)		Cumulative Plus Project (Traditional)	
		AM	PM	AM	PM	AM	PM
1. SR 4, west of Lone Tree Way/A St.	EB	--	**1,154**	--	**1,181**	--	**1,185**
	WB	**711**	--	**732**	--	**736**	--
2. SR 4, west of Hillcrest Ave.	EB	--	**1,063**	--	**1,074**	--	**1,075**
	WB	**615**	--	**617**	--	**617**	--

Notes:
- EB = Eastbound; WB = Westbound.
- **Bold** indicates volume exceeds desired volume of 600 vehicles per hour.

Source: Fehr & Peers, 2018.

Based on the above, under the Cumulative Plus Project Condition, the proposed project would worsen substandard operations of Eastbound SR 4 west of Lone Tree Way/A Street, resulting in conflicts with the established delay index MTSO. In addition, the proposed project would result in conflicts with the established MTSO for HOV lane utilization at SR 4 west of Lone Tree Way/A Street and SR 4 west of Hillcrest Avenue. Thus, a ***significant*** impact to study freeway facilities could occur.

Mitigation Measure(s)

The portions of SR 4 west of SR 160 have been constructed to the planned ultimate right-of-way, and additional freeway improvements have not been proposed. The CCTA has developed the SR 4 Integrated Corridor Management Plan, which includes strategies such as adaptive ramp metering, incident management, traffic and transit information systems, traffic arterial and transit information systems, connected vehicle technologies, and integration with the Interstate 80 corridor ICM to better manage traffic flows along the corridor. Payment of ECCRFFA fees provides funding for the SR 4 Integrated Corridor Management Plan and the related improvements. However, given the absence of planned freeway improvements, even with the payment of ECCRFFA fees, feasible mitigation does not exist to improve operations of the impacted freeway segments of SR 4, west of Lone Tree Way/A Street, and the HOV lanes west of Lone Tree Way/A Street and west of Hillcrest Avenue, and the impact would be *significant and unavoidable.*

Multi-Generational Plan and Traditional Plan

4.12-9 Implement Mitigation Measure 4.12-2(b).

4.12-10 Cumulatively conflict with adopted policies, plans, or programs regarding public transit, bicycle or pedestrian facilities, or otherwise decrease the performance or safety of such facilities. Based on the analysis below, the impact is *less than significant.*

As discussed previously, the proposed project is consistent with the 4,000-unit cap identified for the Sand Creek Focus Area per the City's General Plan. As such, increased demand on transit services and bicycle and pedestrian facilities associated with buildout of the proposed project site, as well as other pending development in the project region, has been previously considered by the Eastern Contra Costa Transit Authority (Tri Delta Transit) and accounted for in regional alternative transportation planning efforts.

The proposed project is generally consistent with applicable policies related to transit services, including General Plan Policy 7.5.2.g, and transit facilities would be provided along the proposed Sand Creek Road extension within the project site. As discussed in detail above, the proposed project would provide for pedestrian and bicycle facilities throughout the project site, and would include connections to existing facilities in the surrounding area. Thus, the proposed project would be consistent with General Plan Policies 7.4.2.a. through 7.4.2.p related to non-motorized transportation. By providing increased bicycle and pedestrian connectivity in the project area, the proposed project would support future development of alternative transportation facilities within the adjacent areas of the Sand Creek Focus Area.

Based on the above, the proposed project would have a ***less-than-significant*** impact with regard to cumulative conflicts with adopted policies, plans, and programs regarding public transit, bicycle, and pedestrian facilities, and cumulative increases in demand for such services and facilities.

Mitigation Measure(s)
None required.