TRAFFIC IMPACT STUDY

FOR THE

BRISCO BATCH PLANT PROJECT

Atwater, CA

Prepared For:

City of Atwater
750 Bellevue Road
Atwater, CA 95301

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0574-A-01

BRISCO BATCH PLANT PROJECT
TRAFFIC IMPACT STUDY
Atwater, CA

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INTRODUCTION

This study summarizes **KD Anderson & Associates'** analysis of the potential short-term and long-term traffic impacts associated with **Brisco Batch Plant** project in the City of Atwater, Merced County, California.

PROJECT DESCRIPTION

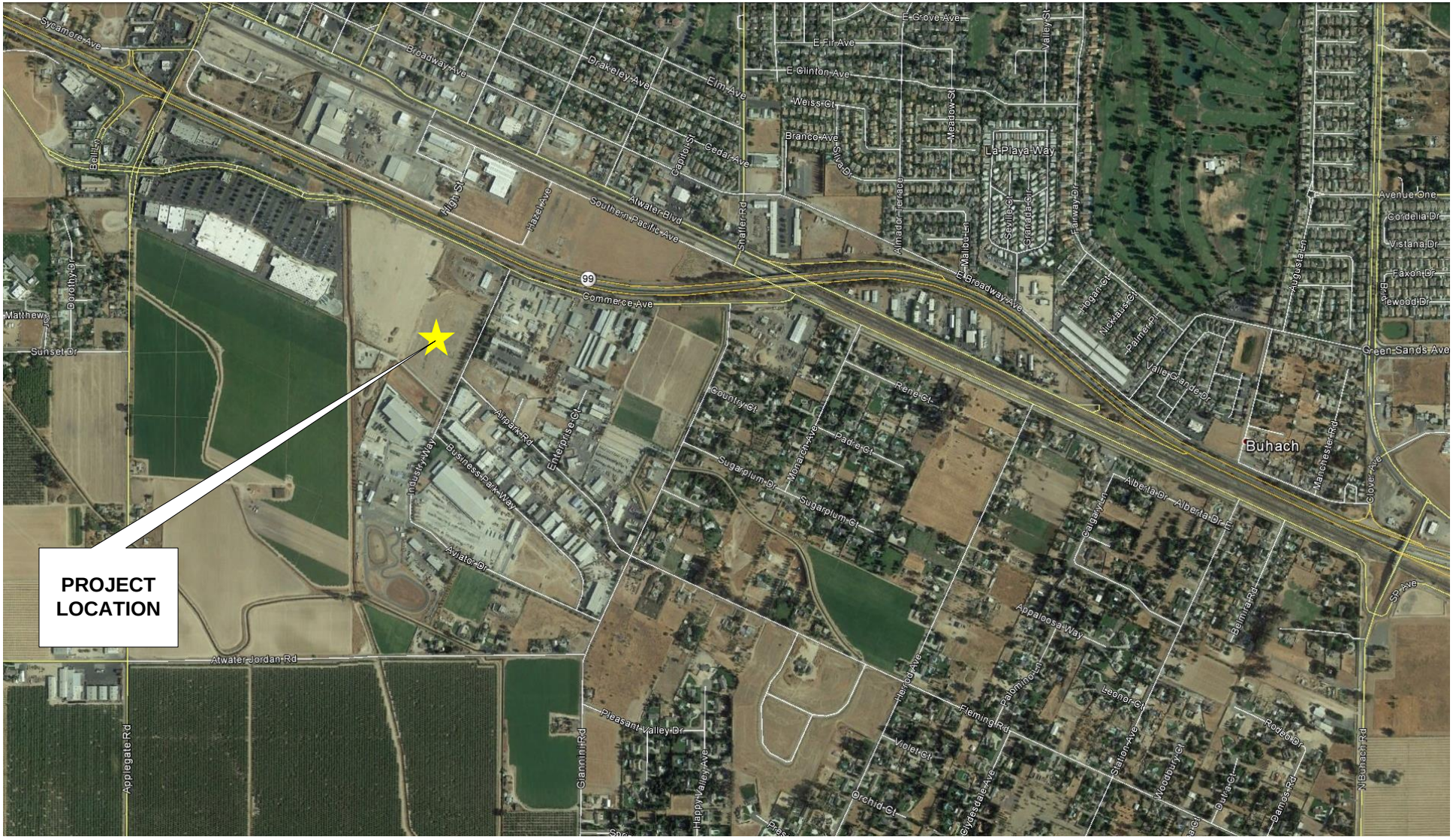
The applicant, Jim Brisco Enterprises, Inc., proposes a conditional use permit for the construction of a concrete batch plant and materials yard facility. The Brisco Batch Plant project (proposed project) site is located south of Commerce Avenue and west of Industry Way in the City of Atwater. The northeast corner of the project site is approximately 350 feet south of the intersection of Industry Way & Commerce Avenue. The location of the project site is shown in **Figure 1**.

The project site plan is shown in **Figure 2**. The site is approximately 10.8 acres in size. The proposed project would include the following features:

- a ready mix batch plant,
- a concrete reclaimer,
- a concrete recycling plant,
- truck and equipment maintenance buildings with wash rack,
- a truck scale and parking,
- a concrete product warehouse building,
- an office/showroom building, and
- customer and employee parking lots.

These project features are described in more detail below.

Jim Brisco Enterprises, Inc. currently operates a concrete batch plant in Livingston. The proposed new concrete batch plant and materials yard in Atwater would allow the applicant to offer the sale of concrete and landscaping material to the construction industry and home owners in the Atwater area. Normal hours of operation would be Monday through Friday from 6:00 a.m. to 5:00 p.m., with the occasional need to open prior to, and close after, those hours. Saturday and Sunday hours would be on an as-needed basis. Based on contractor and delivery requirements, these hours of operation would be extended or altered as needed.



VICINITY MAP

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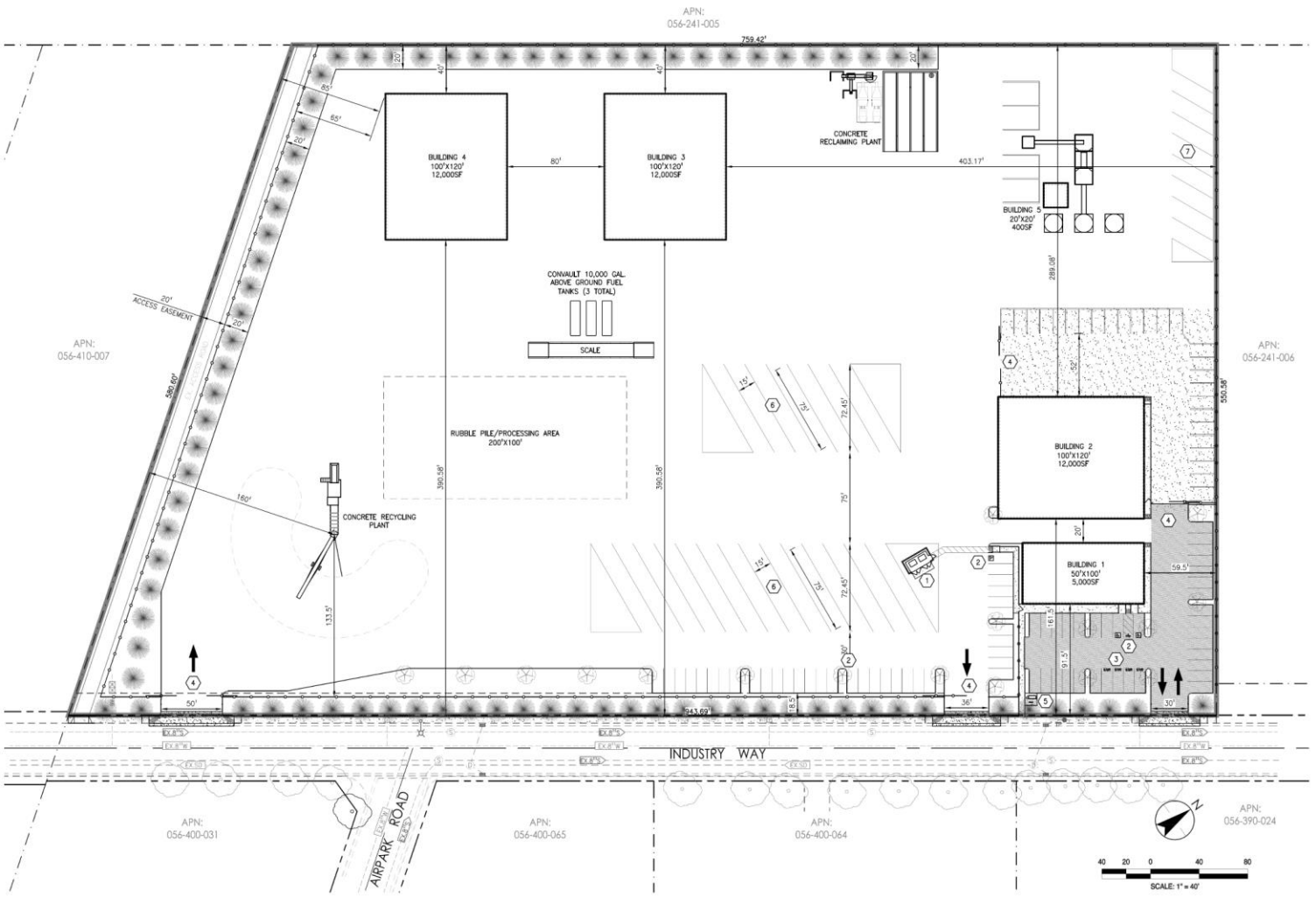
figure 1



KEYNOTES

1. PROPOSED TRASH ENCLOSURE
2. PROPOSED ACCESSIBLE PARKING
3. PROPOSED CALGREEN PARKING
4. PROPOSED GATE
5. CALGREEN SHORT/LONG TERM BICYCLE PARKING
6. PROPOSED TRUCK PARKING (21 PROVIDED)
7. PROPOSED MIXER PARKING (8 PROVIDED)

EXISTING PARCEL INFORMATION

OWNER:	CITY OF ATWATER
APPLICANT:	JIM BRISCO ENTERPRISES, INC.
ASSESSOR PARCEL NUMBER (APN):	056-240-007 (±10.76 AC)
PROPERTY ADDRESS:	630 INDUSTRY WAY
CURRENT GENERAL PLAN DESIGNATION:	MANUFACTURING
CURRENT ZONING:	M-2 (INDUSTRIAL)
EXISTING USE OF PROPERTY:	VACANT
EXISTING STRUCTURES:	NONE
SURROUNDING USES:	INDUSTRIAL

PROPOSED DEVELOPMENT INFORMATION

PARCEL SIZE:	NO CHANGE
PROPERTY ADDRESS:	NO CHANGE
GENERAL PLAN DESIGNATION:	NO CHANGE
ZONING:	NO CHANGE
USE OF PROPERTY:	CONCRETE BATCH PLANT / LANDSCAPE MATERIAL SALES YARD
STRUCTURES:	BUILDING 1- 5000 SF OFFICE/RETAIL
	BUILDING 2- 12000 SF WAREHOUSE
	BUILDING 3- 400 SF OFFICE
	1600 SF STORAGE
	10000 SF MECHANIC SHOP
	BUILDING 4- 400 SF OFFICE
	1600 SF STORAGE
	10000 SF MECHANIC SHOP
	BUILDING 5- 400 SF BATCH PLANT OFFICE

SETBACKS (AMC 17.63.040)
EXTERIOR: 15'
INTERIOR: 0'

PARKING REQUIREMENTS

MECH. SHOP/STORAGE	35200 SF	35200/800 = 44	(AMC 17.63.040)
OFFICE/RETAIL	6200 SF	6200/250 = 24.8	(AMC 17.63.030)
TOTAL REQUIRED			68.8= 69 SPACES

ANALYSIS

STANDARD	60	(87.0%)
ACCESSIBLE	3	(4.3%)
CALGREEN	6	(8.7%)
TOTAL PROVIDED	69	(100.0%)

LANDSCAPING REQUIREMENTS

TOTAL SITE	468849 SF	
10% REQUIRED	46885 SF	(AMC 17.42.060)
LANDSCAPE PROVIDED	47006 SF	

SHADE TREE REQUIREMENTS (AMC 17.42.080)
1 TREE FOR EVERY 10 SPACES PROVIDED

VICINITY MAP

LEGEND

- RIGHT OF WAY
- PARCEL LINE
- PROJECT BOUNDARY
- EXISTING ROLL CURB AND GUTTER
- EXISTING ELECTROLIER
- EXISTING WATER MAIN
- EXISTING WATER METER BOX
- EXISTING FIRE HYDRANT
- EXISTING SEWER MAIN
- EXISTING SEWER MANHOLE
- EXISTING STORM DRAIN LINE
- EXISTING STORM DRAIN MANHOLE
- EXISTING STORM DRAIN INLET
- PROPOSED CHAINLINK FENCE
- PROPOSED ASPHALT
- PROPOSED CONCRETE
- PROPOSED CONCRETE SIDEWALK
- PROPOSED LANDSCAPE

JIM BRISCO ENTERPRISES, INC.
SITE PLAN
ATWATER, CALIFORNIA
MAY, 2018
SHEET 1 OF 3

VVH CONSULTING ENGINEERS
430 10th Street Tel: 209.568.4477
Modesto, CA 95354 Fax: 209.568.4478

SITE PLAN

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figure 2

The project site would be fenced with gated access via three driveway connections to Industry Way. Customer parking would be paved and adjacent to the office/showroom building. Behind the office/showroom building would be bulk material sales bins and rental equipment parking. This area would be paved in concrete. Most of the site would be paved in asphalt concrete and would include areas for truck and equipment parking. Project-related truck trips would include mixer trucks and other trucks to deliver aggregates or other bulk materials to customers.

Concrete Batch Plant

The batch plant would be made up of several pieces of individual equipment, the tallest being the silos for Portland cement and fly ash. These silos can be as tall as 80 feet. The batch plant is a dry plant or Transit mix plant. Sand and gravel are stored in bins and Portland cement and fly ash are stored in airtight silos. Airtight silos are used to reduce the impact to air quality. The sand, gravel, Portland cement and fly ash are then loaded on a conveyor and discharged into the mixer truck along with water. The trucks then transport the concrete mix to job sites. When the mixer truck returns to the plant it is washed out at the concrete reclaimer.

Concrete Reclaimer. Concrete mixer trucks and equipment returning to the site with wet material would be washed out in the concrete reclaimer. The concrete reclaimer washes the Portland cement off the rock and sand. The rock and sand are then stockpiled for reuse. The Portland cement slurry is put in a settling pond. The slurry settles out of the water and the water is recycled for use in the batch plant operation, and the slurry is dried and recycled for base rock.

Concrete Recycling

Broken concrete would be dropped off from customers and stockpiled for periodic recycling. The material is sized down with the pulverizer, then crushed in the impact crusher. The impact crusher sizes the material to meet state specifications for base rock, and the base rock is moved from the impact crusher to the stockpile via a 60-foot-long radial stacker (conveyor). The stockpile area would have a volume of approximately 5,153 yards.

Maintenance Buildings

The proposed project includes three maintenance buildings. Each building would be 12,000 square feet in size, and include approximately 1,600 square feet of storage and 400 square feet of office space. These buildings would be used for equipment maintenance and repair, and fabrication. The storage space would be for storage of parts and tools used to repair, maintain and fabricate.

Truck Scale and Parking

The project site would include a truck parking area that would provide 21 parking spaces. The area would be paved, and the spaces would be 15 feet wide and 75 feet deep. This area would be paved in asphalt concrete. Adjacent to the truck parking spaces would be a scale used for weighing trucks in and out.

Office, Showroom and Warehouse

The office/showroom would be 5,000 square feet in size and would include offices for operations of the business and a showroom for sales of tools, equipment and materials. The warehouse building would be adjacent to the office/showroom, would be 12,000 square feet in size, and would warehouse tools, equipment and materials for sale.

Adjacent to these building would be customer parking areas with Cal Green and ADA designated parking stalls meeting all applicable building codes. The parking area would be paved and include concrete sidewalks and landscape areas between the parking area and Industry Way. Access to the parking area would be via a driveway connection to Industry Way.

Bulk Material Area

The bulk materials area would be paved in concrete and include 26 24-feet by10-feet bins, and six rental equipment parking spaces. The bins would be constructed of concrete wall and hold bulk materials such as, bark, rocks, fill dirt, and potting soil. These materials would be loaded into customer vehicles and trailers. This area would have two access points and would be gated.

ANALYSIS SCENARIOS

The analysis contained in this study follows the requirements of the City of Atwater and Caltrans traffic study guidelines. Existing conditions in the study area have been described in terms of current traffic conditions occurring during a.m. and p.m. peak hours at intersections and freeway ramp junctions. The analysis also considers the impacts of the proposed project with a background of cumulative traffic conditions occurring in the year 2035 with the planned future land use development and the initial phase of the Atwater-Merced Expressway (AME) project.

The development scenarios analyzed for this study are:

- Existing Conditions,
- Existing Conditions Plus the Brisco Batch Plant Project,
- 2035 Cumulative Conditions without the Brisco Batch Plant Project, and
- 2035 Cumulative Conditions Plus the Brisco Batch Plant Project.

Comparison of these four scenarios allows identification of project-related impacts with both near-term and long-term background conditions. Near-term impacts are identified by assess the effects of the project with existing background traffic volume conditions. Long-term impacts are identified by assess the effects of the project with long-term future cumulative background traffic volume conditions.

As needed, this study also presents analysis of scenarios including recommended roadway improvements and mitigation measures.

LEVEL OF SERVICE THRESHOLDS

In this study, project-related impacts and the need for improvements are based on minimum levels of service (LOS) established by agencies responsible for maintaining roadways. The City of Atwater designates LOS D as their minimum standard, while the Merced County General Plan Circulation Element establishes LOS C as the minimum acceptable condition in rural portions of the County and LOS D as the urban standard. For this study, the County's urban LOS D threshold is applied. The Caltrans document *Transportation Concept Report – State Route 99 - District 10* (California Department of Transportation 2017) (TCR) identifies LOS D as the minimum in the Atwater area.

LOS is defined below in the *Level of Service Calculation* section of this report. More detail on the minimum LOS established by agencies is presented below in the *Regulatory Setting* section of this traffic impact study.

EXISTING SETTING

This section of the study describes the transportation facilities available in the study area, current traffic volume levels, and accompanying traffic operations and LOS at the intersections and freeway ramp junctions in the study area.

EXISTING STREET AND HIGHWAY SYSTEM

Various state highways, City of Atwater streets and Merced County roads would be used to access the project site. The project site is served by roads that connect the site with State Route (SR) 99, with the City of Atwater, and with adjoining rural communities in Merced County.

The text that follows provides a general overview of the study area street and highway system, which is also shown in **Figure 1**.

State Route 99 is the primary north-south transportation corridor through Merced County. In the vicinity of the project site, it has a west-northwest to east-southeast alignment. SR 99 is generally a four to six lane controlled access freeway. Recent improvement projects have upgraded this facility in many locations, but today the portion of SR 99 in the vicinity of the project site remains four lanes. Access to SR 99 occurs at several interchanges, some of which are unconventional in nature. For the Brisco Batch Plant project, access to SR 99 is provided via the Applegate Road interchange northwest of the project site, and the Atwater Boulevard ramps northeast of the project site. The most recent traffic count data available from Caltrans (2017) indicate that SR 99 carries an average annual daily traffic (AADT) volume of 52,000 vehicles per day between the Applegate Road interchange and the Atwater Boulevard ramps (California Department of Transportation 2019).

Commerce Avenue is a collector street with a generally east-west alignment approximately 350 feet north of the project site. The eastern terminus of Commerce Avenue is at SP Avenue, approximately one-half mile east of the project site. In the immediate vicinity of the project site Commerce Avenue is two lanes wide (one lane in each direction). West of a point approximately one-quarter mile northwest of the project site, it is four lanes wide (two lanes in each direction). West of Applegate Road, Commerce Avenue continues as Bell Road and intersects with SR 99 southbound ramps.

SP Avenue is sometimes referred to as Southern Pacific Avenue. In the vicinity of the project site, it is a two-lane frontage roadway parallel and adjacent to SR 99. In the vicinity of the project site, railroad tracks are aligned parallel to and between SR 99 and SP Avenue.

Buhach Road is a north-south arterial roadway approximately one and a half miles east of the project site. It is two-lanes to four-lanes wide, provides access to Santa Fe Drive in northern Atwater, and provides access to SR 140 south of Atwater. Access from the project site to Buhach Road is provided by Commerce Avenue and SP Avenue.

Shaffer Road is a north-south arterial roadway aligned through the center of Atwater. In the vicinity of the project site it is four lanes wide. The southern terminus of Shaffer Road is at SP Avenue. The northern terminus is at the Merced River approximately five miles north of Atwater.

Atwater Boulevard is a four-lane roadway parallel and adjacent to SR 99 in the vicinity of the project site. The eastern terminus is at ramp connections with SR 99. West of Applegate Road, it is two-lanes wide with a center left-turn lane.

Santa Fe Drive is a northwest-southeast arterial road that traverses Merced County from the Stanislaus County line to the City of Merced. Santa Fe Drive is a two-lane wide roadway in the area from the Stanislaus County line to Buhach Road and a four-lane wide facility from Buhach Road to SR 59 on the edge of Merced.

Applegate Road is a north-south arterial roadway approximately one-half mile west of the project site. South of Atwater Boulevard, Applegate Road is generally two lanes wide. North of Atwater Boulevard, it is four lanes wide and continues as Winton Way through the City of Winton. The northern terminus is at Meadow Drive approximately six miles north of the project site. Applegate Road and Winton Way is an important arterial roadway through the western portion of Atwater and provides access to SR 99 via the Applegate Road interchange.

Industry Way is a north-south two-lane wide local roadway that would provide direct access to the project site. The northern terminus of Industry Way is at the intersection with Commerce Avenue. The southern terminus is at Aviator Drive, approximately 1,100 feet south of the southeast corner of the project site.

Giannini Road is a north-south two-lane wide collector roadway approximately one-third mile east of the project site. The northern terminus of Giannini Road is at the intersection with Commerce Avenue. The southern terminus is at Mulberry Avenue, approximately one mile south of the project site. Giannini Road intersects with Atwater Jordan Road, which provides access to Applegate Road.

STUDY INTERSECTIONS

The quality of flow of traffic is often governed by the operation of intersections, and the operation of the following nine existing intersections was analyzed for this study:

1. Applegate Road & Sycamore Avenue
2. Applegate Road & Bell Drive/Commerce Avenue
3. State Route 99 Southbound Ramps & Bell Drive
4. Industry Way & Commerce Avenue
5. Giannini Road & Commerce Avenue
6. Commerce Avenue & SP Avenue

7. Shaffer Road & SP Avenue
8. Shaffer Road & Atwater Boulevard
9. Buhach Road & SP Avenue

With implementation of the Brisco Batch Plant project, three driveway intersections would be created along Industry Way:

10. Industry Way & North Project Site Driveway
11. Industry Way & Central Project Site Driveway
12. Industry Way & South Project Site Driveway

The study area includes freeway ramp junctions at the Applegate Road interchange on SR 99 and its ramps. The following freeway ramp junction areas were analyzed for this study.

A. Southbound SR 99 off-ramp to Applegate Road
B. Southbound SR 99 on-ramp from Applegate Road
C. Northbound SR 99 off-ramp to Applegate Road
D. Northbound SR 99 on-ramp from Applegate Road

The locations of the study intersections and freeway ramp junctions are presented in **Figure 3**.

EXISTING TRAFFIC VOLUMES

To quantify existing traffic conditions, a.m. and p.m. peak hour traffic count data were collected at the existing study area intersections. Data were collected at the intersection of Buhach Road & SP Avenue on Tuesday May 3, 2016. Data were collect at all other study intersections on Thursday August 24, 2017. The data were collected during the 7:00 a.m. to 9:00 a.m. period, and the 4:00 p.m. to 6:00 p.m. period. Traffic volumes for the highest one-hour periods within the two-hour a.m. and two-hour p.m. data collection periods are used in this study. This approach is consistent with the analyses contained in other recent traffic studies in Merced County. The peak hour intersection traffic volume count data sheet are presented in the technical appendix and are summarized in **Figure 4**.

For the SR 99 mainline and the freeway ramps at the Applegate Road interchange, a.m. peak hour and p.m. peak hour traffic volume data were collected from the Caltrans Performance Measurement System (PeMS) database. This on-line database is available at the following internet address: http://pems.dot.ca.gov/. The freeway ramp junction peak hour traffic volumes are summarized in **Figure 5**.

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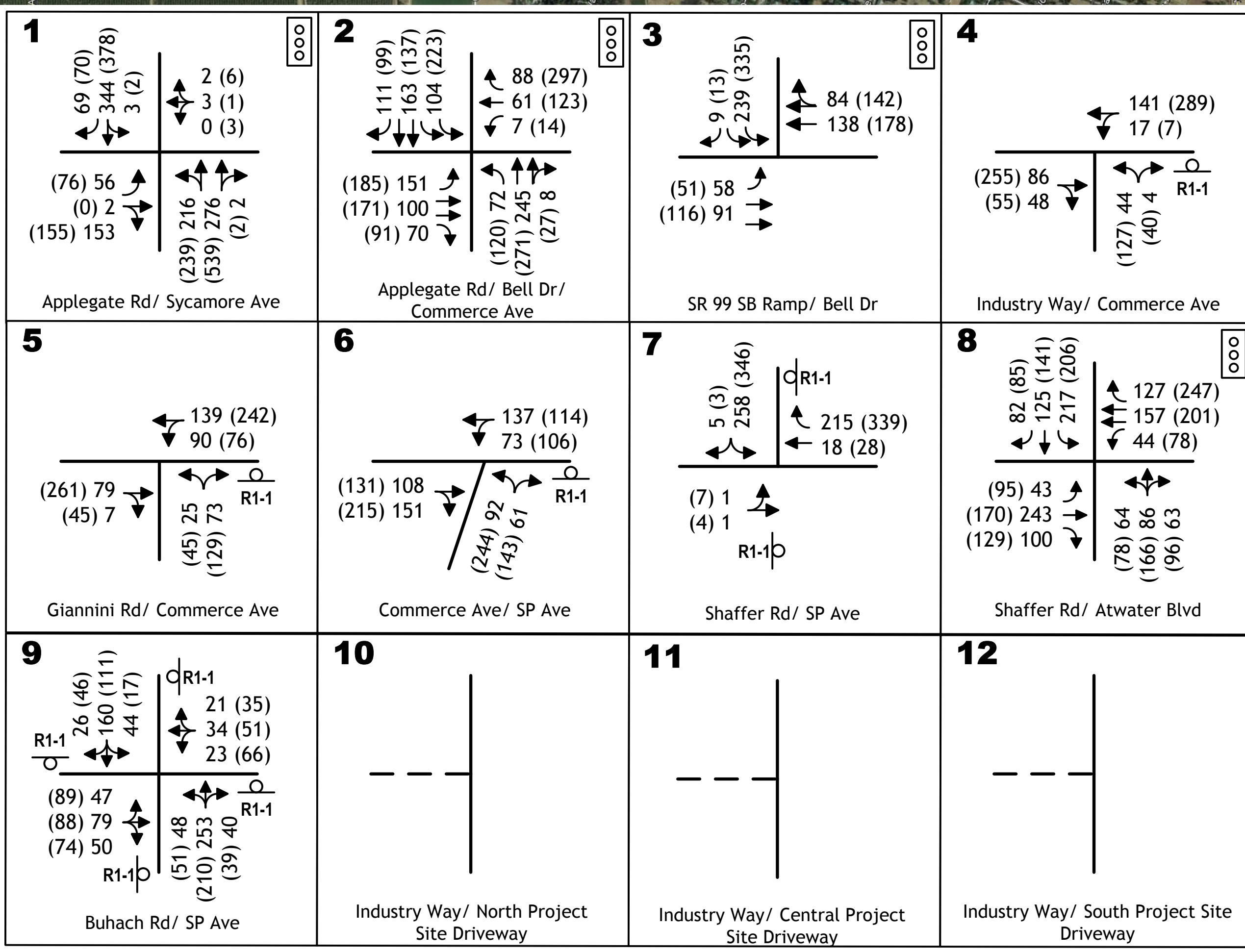
STUDY INTERSECTIONS AND RAMP JUNCTIONS

figure 3



EXISTING INTERSECTION TRAFFIC VOLUMES AND LANE CONFIGURATIONS

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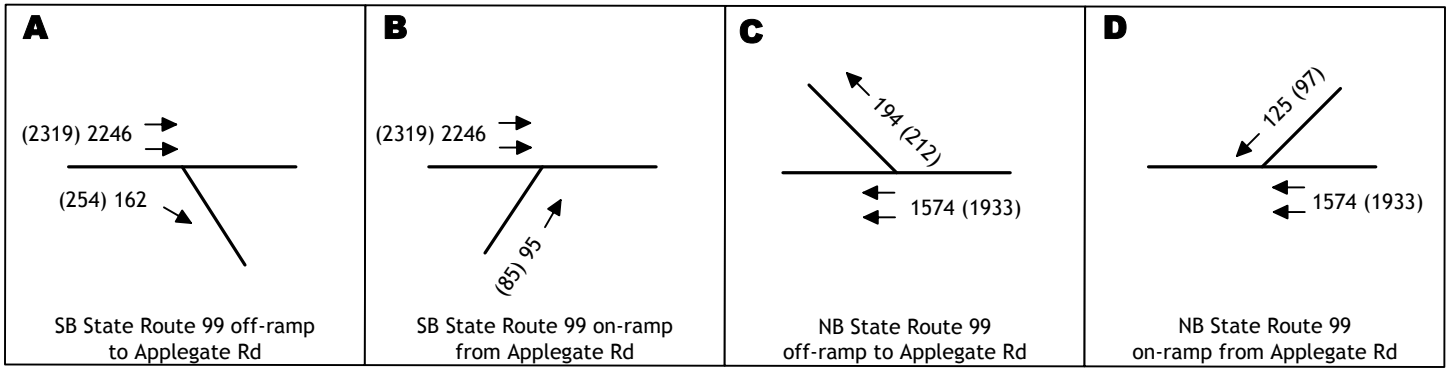
figure 4



EXISTING RAMP JUNCTION TRAFFIC VOLUMES

Existing roadway segment daily traffic volume data were also collected for this study. Traffic volume data were collected for 24-hour periods at the following four locations:

- Applegate Road - Bell Drive/Commerce Avenue to Sunset Drive
- Commerce Avenue - Applegate Road to Industry Way
- Commerce Avenue - Industry Way to SP Avenue
- SP Avenue - Commerce Avenue to Buhach Road

Existing roadway segment daily traffic volume data are presented in **Table 1**. This table also presents daily traffic volume data for the other scenarios previously listed in the *Analysis Scenarios* section of this study.

LEVEL OF SERVICE CALCULATION

To quantitatively evaluate traffic conditions and to provide a basis for comparison of operating conditions with and without project-generated traffic, LOS were determined at study area intersections and freeway ramp junctions.

LOS is a quantitative measure of traffic operating conditions using a letter grade A through F. LOS A through F represents progressively worsening traffic conditions. The characteristics associated with the various LOS for intersections are presented in **Table 2**. LOS E and F are associated with severe congestion and delay and are unacceptable to most motorists. The City of Atwater designates LOS D as their minimum standard, while the Merced County General Plan Circulation Element establishes LOS C as the minimum acceptable condition in rural portions of the County and LOS D as the urban standard.

LOS were calculated for study intersections and freeway ramp junctions using the applicable methodology contained in the *Highway Capacity Manual 2010* (Transportation Research Board 2010). The text that follows summarizes these methodologies.

Signalized Intersections. The methodology employed for determining LOS at signalized intersections makes use of data describing traffic volume, intersection geometry and traffic signal timing to calculate the overall average delay per vehicle passing through the intersection. This average delay is compared to the prescribed thresholds to identify the applicable LOS. Study intersections were evaluated using SYNCHRO software (Trafficware 2019) for this traffic impact study.

Unsignalized Intersections. The procedure for calculating the LOS at unsignalized intersections is based on the relative availability of gaps in traffic and the delay experienced for each movement that must yield the right-of-way. The number of gaps is a function of the volume and speed of conflicting traffic, type of control (stop or yield), and intersection geometrics. While the length of average delays and LOS can be calculated for each movement, an overall "weighted" LOS can be calculated. Study intersections were evaluated using SYNCHRO software (Trafficware 2019) for this traffic impact study.

Table 1. Roadway Segment Daily Traffic Volumes

Roadway Segment	Existing Conditions	Existing Plus Project	Cumulative No Project	Cumulative Plus Project
Applegate Road - Bell Drive/Commerce Avenue to Sunset Drive	6,735	6,735	12,852	12,852
Commerce Avenue - Applegate Road to Industry Way	7,633	7,673	11,912	11,952
Commerce Avenue - Industry Way to SP Avenue	6,365	6,415	11,417	11,467
SP Avenue - Commerce Avenue to Buhach Road	5,046	5,052	10,056	10,062

Sources: KD Anderson & Associates 2019, and
MCAG Travel Demand Forecasting Model

Table 2. Level of Service Definitions - Highway Capacity Manual 2010

Level of Service	Signalized Intersections	Unsignalized Intersections and Roundabouts
A	Vehicle progression is exceptionally favorable or the cycle length is very short. Delay ≤ 10.0 seconds/vehicle	Little or no delay. Delay ≤ 10 seconds/vehicle
B	Vehicle progression is highly favorable or the cycle length is short. Delay > 10 seconds/vehicle and ≤ 20 seconds/vehicle	Short traffic delays. Delay > 10 seconds/vehicle and ≤ 15 seconds/vehicle
C	Vehicle progression is favorable or the cycle length is moderate. Individual cycle failures may begin to appear at this level. Delay > 20 seconds/vehicle and ≤ 35 seconds/vehicle	Average traffic delays. Delay > 15 seconds/vehicle and ≤ 25 seconds/vehicle
D	Vehicle progression is ineffective or the cycle length is long. Many vehicles stop and the individual cycle failures are noticeable. Delay > 35 seconds/vehicle and ≤ 55 seconds/vehicle	Long traffic delays. Delay > 25 seconds/vehicle and ≤ 35 seconds/vehicle
E	Vehicle progression is unfavorable and the cycle length is long. Individual cycle failures are frequent. Delay > 55 seconds/vehicle and ≤ 80 seconds/vehicle	Very long traffic delays, failure, extreme congestion. Delay > 35 seconds/vehicle and ≤ 50 seconds/vehicle
F	Vehicle progression is very poor and the cycle length is long. Most cycles fail to clear the vehicle queue. Delay > 80 seconds/vehicle	Intersection blocked by external causes. Delay > 50 seconds/vehicle

Source: Transportation Research Board 2010.

LOS at unsignalized intersections controlled by side street stops are indicative of the magnitude of the delay incurred by motorists turning at the intersection. However, because these calculations exclude the condition of through traffic flow (which is assumed to flow freely), unsignalized poor LOS may not be judged to be significant unless the volume of traffic also satisfies warrants for traffic signals.

While the unsignalized LOS may indicate very long delays (e.g., LOS E or F) traffic conditions are generally not assumed to be significant unless a significant number of motorists are delayed. For this analysis, the satisfaction of traffic signal warrants has been used to suggest the significance of unsignalized LOS. Although satisfying signal warrants signifies that an intersection has unacceptable operating conditions, it does not mean that installation of a signal is the only way to mitigate those conditions. It is often possible to improve an intersection with additional lanes or improved geometrics so that signalization is not necessary. The peak hour signal warrant criteria employed for this study are those presented in the *California Manual on Uniform Traffic Control Devices* (California Department of Transportation 2014).

Freeway Ramp Junction Level of Service. LOS at freeway ramp junctions has been evaluated using the procedures contained in the Transportation Research Board document *Highway Capacity Manual 2010* (Transportation Research Board 2010). The operation of freeway ramps is evaluated in the immediate vicinity of the point of entry to and exit from the freeway mainline. As noted in **Table 3**, vehicle density in the ramp influence area, expressed in terms of passenger cars per mile per lane, is the evaluation parameter employed to identify ramp junction LOS.

CURRENT LEVELS OF SERVICE

Intersection Levels of Service

Peak hour LOS were calculated at the nine existing study intersections under Existing Conditions. Intersection LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 4**. As shown, eight of the nine existing study intersections operate at acceptable LOS D or better during both the a.m. and p.m. peak hours. No improvements are recommended at these eight intersections.

Commerce Avenue & SP Avenue. The intersection of Commerce Avenue & SP Avenue operates at LOS B with 13.5 seconds of delay during the a.m. peak hour and LOS E with 40.8 seconds of delay during the p.m. peak hour. LOS E is considered unacceptable. To improve LOS to an acceptable level, the following improvement is recommended:

Table 3. Level of Service Criteria for Freeway Merge and Diverge Areas

Level of Service	Vehicle Density	Operating Characteristics
A	Less than or equal to 10.	LOS A represents unrestricted operations. Density is low enough to permit smooth merging and diverging, with very little turbulence in the traffic stream.
B	Greater than 10. Less than or equal to 20.	At LOS B, merging and diverging maneuvers become noticeable to through drivers, and minimal turbulence occurs.
C	Greater than 20. Less than or equal to 28.	At LOS C, speed within the influence area begins to decline as turbulence levels become much more noticeable. Both ramp and freeway vehicles begin to adjust their speeds to accomplish smooth transitions.
D	Greater than 28. Less than or equal to 35.	At LOS D, turbulence levels in the influence area become intrusive, and virtually all vehicles slow to accommodate merging and diverging. Some ramp queues may form at heavily used on-ramps, but freeway operation remains stable.
E	Greater than 35.	LOS E represents conditions approaching or at capacity. Small changes in demand or disruptions within the traffic stream can cause both ramp and freeway queues to form.
F	Demand exceeds capacity.	LOS F defines operating conditions within queues that form on boththe ramp and the freeway mainline when capacity is exceeded by demand.

Note: Vehicle density is expressed as passenger car equivalents per mile per lane.
Source: Transportation Research Board 2010.

Table 4. Intersection Level of Service - Existing Conditions

	Study Intersections	Inters. Control	Signal Warrant Met?	AM Peak		PM Peak	
				LOS	Delay	LOS	Delay
1	Applegate Road & Sycamore Avenue	Signal		B	16.4	C	21.8
2	Applegate Road & Bell Drive / Commerce Avenue	Signal		C	22.0	C	34.2
3	State Route 99 Southbound Ramps & Bell Drive	Signal		B	12.9	B	12.4
4	Industry Way & Commerce Avenue	Unsig	No	B	10.6	C	16.8
5	Giannini Road & Commerce Avenue	Unsig	No	B	10.2	B	14.3
6	Commerce Avenue & SP Avenue	Unsig	Yes	B	13.5	E	40.8
	With Recommended Improvement	*Unsig*	*Yes*	*B*	*12.4*	*C*	*22.0*
7	Shaffer Road & SP Avenue	Unsig	No	B	13.7	C	16.7
8	Shaffer Road & Atwater Boulevard	Signal		C	20.2	C	28.6
9	Buhach Road & SP Avenue	AWSC	No	B	12.0	B	12.4
10	Industry Way & North Project Site Driveway	- -		- -	- -	- -	- -
11	Industry Way & Central Project Site Driveway	- -		- -	- -	- -	- -
12	Industry Way & South Project Site Driveway	- -		- -	- -	- -	- -

Notes: "LOS" = Level of Service. "Inters. Control" = Type of intersection control.
"Signal" = Signalized light control. "Unsig" = Unsignalized stop-sign control. "AWSC" = All-way stop-sign control.
Delay is measured in seconds per vehicle. *Italicized text* indicates conditions with recommended improvement.
Dashes ("- -") indicate the intersection would not be present under this scenario.

Recommended Improvement. At the intersection of Commerce Avenue & SP Avenue, split the single lane northbound approach into an exclusive northbound-to-westbound left-turn lane and an exclusive northbound-to-eastbound right-turn lane. As shown in **Table 4**, with implementation of this recommended improvement this intersection would operate at LOS B with 12.4 seconds of delay during the a.m. peak hour and LOS C with 22.0 seconds of delay during the p.m. peak hour. LOS B and C are considered acceptable.

The intersection of Commerce Avenue & SP Avenue meets the peak hour signal warrant under Existing Conditions. However, because acceptable LOS can achieve without signalization, installing signalized control at this intersection is not recommended.

Freeway Ramp Junction Level of Service

Peak hour LOS was calculated at the four existing study freeway ramp junctions under Existing Conditions. Ramp junction LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 5**. As shown, all four study freeway ramp junctions operate at LOS C or better during both the a.m. peak hour and p.m. peak hour. No improvements are recommended at these four ramp junctions.

ALTERNATIVE TRANSPORTATION MODES

Transit

There are a variety of transit options available in Merced County. The level of transit service available to Merced County residents has increased since transit was introduced to the area in 1974. Historically, public transit has developed in response to the basic transportation needs of Merced's transit-dependent population and has maintained that standard of service.

Bus Service. The Bus, Merced's Regional Transit System, was formed from the consolidation of four former local public transit service providers in July 1996. Today "The Bus" is the single public transportation service provider for all of Merced County.

The Bus is administered and governed by the Transit Joint Powers Authority for Merced County. The authority is made up of an 11 member board of elected officials: one each from the cities of Atwater, Dos Palos, Gustine, Livingston, Los Banos, and Merced, along with five members of the Board of Supervisors of the County of Merced, California.

Currently, buses are operating on 16 fixed routes with another set of buses providing Paratransit service. The Bus carries approximately 1,000,000 passengers per year. (http://www.mercedthebus.com/)

Table 5. State Route 99 Ramp Merge and Diverge Level of Service - Existing Conditions

	Ramp Junction	AM Peak Hour				PM Peak Hour			
		Freeway Volume	Ramp Volume	Density	LOS	Freeway Volume	Ramp Volume	Density	LOS
A	Southbound State Route 99 Off-Ramp to Applegate Road	2,246	162	24.9	C	2,319	254	25.7	C
B	Southbound State Route 99 On-Ramp from Applegate Road	2,246	95	19.1	B	2,319	85	19.7	B
C	Northbound State Route 99 Off-Ramp to Applegate Road	1,574	194	18.2	B	1,933	212	21.8	C
D	Northbound State Route 99 On-Ramp from Applegate Road	1,574	125	14.2	B	1,933	97	17.2	B

Notes: LOS = Level of Service.
Density is expressed in passenger cars per mile per lane.

The Bus provides two routes in the Atwater area:

- Route A1, the Atwater Loop, operates in a generally clockwise loop around the City of Atwater. In the vicinity of the project site, this route provides service to the Target and Walmart retail commercial area, approximately one-quarter mile west of the project site.

- Route A2, Winton Way, operates along a generally north-south route along Winton Way. The northern is in the City of Winton. The southern terminus is at the Target and Walmart retail commercial area, approximately one-quarter mile west of the project site.

Dial-A-Ride. Dial-A-Ride service is primarily for use by senior citizens, the handicapped, or those without a regularly scheduled fixed route bus operating within one mile of their residence. Dial-A-Ride is available to the general public except in the cities of Merced and Los Banos.

In the cities of Merced and Los Banos, Dial-A-Ride service is reserved for the exclusive use by the elderly (age 60 and older) and the handicapped. All Dial-A-Ride users in these two cities must register for Dial-A-Ride service.

Dial-A-Ride is generally open for service from 7:00 a.m. to 6:00 p.m. Monday through Friday and 9:00 a.m. to 5:00 p.m. on Saturday. However, service hours may vary from community to community depending on ridership demand.

To schedule Dial-A-Ride service or to register for service in Merced or Los Banos, residents are provided with telephone access. (http://www.atwater.org/about_publictransportation.html)

Bicycle and Pedestrian Facilities. According to Caltrans guidelines, bicycle facilities are generally divided into four categories:

- Class I Bikeway (Bike Path). A completely separate facility designated for the exclusive use of bicycles and pedestrians with vehicle and pedestrian cross-flow minimized.

- Class II Bikeway (Bike Lane). A striped lane designated for the use of bicycles on a street or highway. Vehicle parking and vehicle/pedestrian cross-flow are permitted at designated locations.

- Class III Bikeway (Bike Route). A route designated by signs or pavement markings for bicyclists within the vehicular travel lane (i.e., shared use) of a roadway.

- Class IV Bikeway (Separated Bikeway). A bikeway for the exclusive use of bicycles and includes a separation required between the separated bikeway and the through vehicular traffic. The separation may include, but is not limited to, grade separation, flexible posts, inflexible posts, inflexible barriers, or on-street parking.

The City of Atwater has limited bicycle facilities. There are a few Class I and Class II bikeways located in the city, including Class I paths along Buhach Road and Juniper Avenue. Class II lanes exist along Bellevue Road and on a portion of Buhach Road. The Atwater Bicycle Plan adopted by the City in 2004 indicates that a Class I path would be extended east from Buhach Road along Avenue Two, and a Class II lane would be extended east and west from Buhach Road along Ashby Road and Green Sands Avenue, respectively.

In the immediate vicinity of the project site, sidewalks have not been constructed along Industry Way or Commerce Avenue.

Existing bicycle and pedestrian travel in the immediately vicinity of the Brisco Batch Plant project site is very low. Bicycle and pedestrian travel data at study intersections was collected for this traffic impact study for four hours - two hours during the a.m. peak period plus two hours during the p.m. peak period. At the intersection of Industry Way & Commerce Avenue one bicycle and one pedestrian were recorded during the four hours. Bicycle and pedestrian travel data collection worksheets are presented in the technical appendix.

REGULATORY SETTING

The following is a description of the existing regulatory setting conditions in the project study area. The study area includes streets and highways that are governed by various state and local jurisdictions. Each has adopted minimum LOS standards for their facilities.

CALTRANS

Caltrans is responsible for state highways, their ramps and for intersections where freeway ramps intersect the local street system. Caltrans generally strives to maintain LOS C on its facilities, but recognizes that circumstances may limit their ability to do so. The following two documents are relevant.

- The Caltrans document *Guide for the Preparation of Traffic Impact Studies* (California Department of Transportation 2002) identifies circumstances under which Caltrans determines that a traffic impact study would be required. The document also details information that is to be included in the study, analysis scenarios, and guidance on acceptable analysis methodologies.

- The Caltrans document *Transportation Concept Report – State Route 99 - District 10* (California Department of Transportation 2017) (TCR) is a long-term planning document that each Caltrans district prepares for every state highway or portion thereof in its jurisdiction. This document usually represents the first step in Caltrans' long-range corridor planning process. The purpose of a TCR is to determine how a highway will be developed and managed so that it delivers the targeted LOS and quality of operations that are feasible to attain over a 20-year period. These are indicated in the "route concept." In addition to the 20-year route concept level, the TCR includes an "ultimate concept," which is the ultimate goal for the route beyond the 20-year planning horizon. Ultimate concepts must be used cautiously, however, because unforeseen changes in land use and other variables make forecasting beyond 20 years difficult. TCRs do not necessarily consider the amount, type, and location of development within local agency General Plans. The SR 99 TCR identifies LOS D as the minimum in the Atwater area, and this standard has been applied in this traffic impact study.

MERCED COUNTY

The *2030 Merced County General Plan* (County of Merced 2013) *Circulation Element* focuses on providing roadways for growing automobile demands and alternative modes of transportation. This requires improving those alternative modes through regional coordination, improved funding, better land use and design, and fair pricing. The overarching goal of the element seeks a balanced transportation system that moves people and goods in a safe and efficient way that

minimizes environmental impacts, supports urban land uses, and serves rural needs. The following are two policies of the *General Plan Circulation Element* related to LOS standards:

> "Policy CIR-1.5: County Level of Service Standards (RDR)
> Implement a Countywide roadway system that achieves the following level-of-service (LOS) standards during peak traffic periods:
>
> "a) For roadways located within rural areas: LOS "C" or better.
>
> "b) For roadways located outside Urban Communities that serve as connectors between Urban Communities: LOS of "D" or better.
>
> "c) For roadways located within Urban Communities: LOS of "D" or better.
>
> "Policy CIR-1.6: Level of Service "E" Exception (RDR)
> Allow a level of service "E" or worse only on a minor component of the circulation system (such as a left turn movement from a local roadway) if the major component of the circulation system (such as a through movement on a collector or arterial roadway) would be significantly compromised in the process of improving the level of service of the minor component."

Merced County administers urban land uses within the unincorporated area of the county through Community Plans. Community Plans have been adopted for Delhi, Foxhills, Franklin-Beachwood, Hilmar, Santa Nella and Villages of Laguna San Luis, and updates to plans are underway in Planada, La Grand, and Winton. An update to the Franklin-Beachwood Community plan is anticipated but has not proceeded. LOS D is the minimum standard in community plan areas.

Merced County has not adopted a countywide program to fund improvement to county roadways. Instead, the county has adopted individual Bridge and Major Thoroughfare (B&MT) fee programs for Community Plans. B&MT fees have been adopted for Atwater RRC, Delhi, Hilmar, Planada, Santa Nella, Winton Community Plans and Franklin Beachwood SUDP.

CITY OF ATWATER

The City of Atwater is responsible for streets within the city limits. The City's minimum LOS standard is D.

In 2003, the City of Atwater adopted a Development Impact Fee program. Completed and future circulation system improvements constructed through the fee program in the vicinity of the project site include:

- signalization of the intersection of Buhach Road and Avenue One,
- improvement of Avenue One between Buhach Road and Gurr Road,
- improvement of Avenue Two between Buhach Road and Gurr Road, and
- Buhach Road widening north of bridge to Bellevue Road.

The City of Atwater also administers an area of benefit funding program for improvements to the Avenue One and Avenue Two bridges over Canal Creek.

MERCED COUNTY ASSOCIATION OF GOVERNMENTS

The Merced County Association of Governments (MCAG) administers the Regional Transportation Impact Fee (RTIF) program. Many local governments have or are considering development fee programs to mitigate traffic impacts within their jurisdiction. However, transportation impacts beyond their jurisdictions are not included. The Regional Transportation Impact Fee Program provides additional revenue to mitigate transportation impacts on the regional road network. (http://www.mcagov.org/150/Regional-Transportation-Impact-Fee)

PROJECT CHARACTERISTICS

The following is a description of characteristics of the Brisco Batch Plant project used in the assessment of project-related impacts on traffic operations.

TRIP GENERATION

Analysis of traffic-related impacts associated with a land use development project requires an estimate of the number of vehicle trips generated by the project. The industry-standard document *Trip Generation Manual 10th Edition* (Institute of Transportation Engineers 2017) is often used as a source document for estimating trip generation. This document presents trip generation rates for many common types of land use development projects (e.g., residential housing, offices, or retail commercial). However, not all types of land use development are included in *Trip Generation Manual 10th Edition*, and this document does not include concrete batch plant and materials yard facilities.

To estimate the number of trips that would be generated by the Brisco Batch Plant project, project-specific information was provided by the City of Atwater staff, applicant, and applicant's engineer (Reed pers. comm. and Rashe pers comm.). The following is a brief summary of the data that were provided for the various categories of project-related activities that would generate vehicle trips.

Employees

- 54 to 74 employee commute trips per day, one-half inbound and one-half outbound;
- 12 to 20 employee commute trips in the a.m. peak hour, all assumed to be inbound; and
- 12 to 20 employee commute trips in the p.m. peak hour, all assumed to be outbound.

Concrete Trucks

- 50,000 cubic yards per year;
- 9 cubic yards per load;
- 5,556 concrete truck loads per year; and
- concrete trucks would operate approximately 293 days per year.

Aggregate Material

- 80,000 tons of aggregate material per year;
- 27 tons per load; and
- 2,963 loads per year.

It was assumed aggregate material would be hauled approximately 293 days per year.

Cement Material

- 11,750 tons per year;
- 26 tons per load; and
- 452 loads per year

It was assumed cement material would be hauled approximately 293 days per year.

Concrete Recycling

- 25,000 tons per year inbound;
- 25,000 tons per year outbound;
- 25 tons per load;
- 1,000 loads per year inbound; and
- 1,000 loads per year outbound.

It was assumed concrete recycling material would be hauled approximately 293 days per year.

Retail Sales

- 150 loads per year,
- 150 trips per year inbound, and
- 150 trip per year outbound.

Retail sales would be open seven days per week during the spring, summer and fall, and six days per week during the winter.

Hourly Pattern

The data described above were used to estimate trips per day. The City of Atwater staff, applicant, and applicant's engineer also provided information on the hourly trip generation pattern of project-related trips. The information described how the trips per day for each of the category of trips would be distributed over the course of the day. The hourly pattern for concrete, aggregate, cement and concrete recycling material would change seasonally and on a day-to-day basis, depending on market demand, and the type and location of projects. As a result, the actual hourly pattern is expected to change frequently. Based on the provided information, a generalized hourly pattern was estimated for use in this traffic impact study.

Using the information presented above, the trip generation estimate shown in **Table 6** was developed for this traffic impact study. **Table 6** shows trips for each of the various categories of project-related activities that would generate vehicle trips. For each category, estimates for inbound and outbound trips are shown, and estimates are shown for each of the following three time periods:

- daily,
- a.m. peak hour, and
- p.m. peak hour.

Table 6. Brisco Batch Plant Trip Generation

Type of Trip		Trips per Day	AM Peak Hour Trips	PM Peak Hour Trips
Employees	Inbound	37	20	0
	Outbound	37	0	20
Concrete Trucks	Inbound	19	6	1
	Outbound	19	6	1
Aggregate Material	Inbound	10	3	1
	Outbound	10	3	1
Cement Material	Inbound	2	1	1
	Outbound	2	1	1
Concrete Recycling - Inbound Material	Inbound	3	2	0
	Outbound	3	1	0
Concrete Recycling - Outbound Material	Inbound	3	1	1
	Outbound	3	1	1
Retail Sales Yard	Inbound	1	1	0
	Outbound	1	1	0
TOTAL	Inbound	75	34	4
	Outbound	75	13	24

TRIP DISTRIBUTION

Trips that would be generated by the Brisco Batch Plant project were geographically distributed over the roadway network. The geographic trip distribution pattern of trips made for employee commute travel and retail sales is expected to be different from the pattern of trips made by the hauling of concrete and product materials. As a result, two sets of trip distribution patterns were applied for this traffic impact study. The two sets of traffic study patterns are shown in **Table 7**.

Concrete and Materials Haul Routes

A description of concrete and materials haul routes, and estimates of the service and market areas for the Brisco Batch Plant were provided by the applicant's engineer (Reed pers. comm.). As shown in **Table 7**, the large majority of trips would be oriented to the south and east of the project site. A substantial portion of the reason for this is the applicant currently operates a concrete batch plant in the Livingston area. The Livingston batch plant would serve demand from projects to the north and west of the Brisco Batch Plant Atwater project site, while the Atwater plant would serve demand from the south and east of the project site. The following is a summary of haul routes:

- haul routes to the northwest would use the Applegate Road interchange to access SR 99;
- haul routes to the north would use Shaffer Road;
- haul routes to the southeast would use the Atwater Boulevard ramps to access SR 99; and
- haul routes to the south would use Industry Way, Airpark Road, Giannini Road, and Atwater Jordan Road to access Applegate Road.

Employee Commute and Retail Sales

The geographic trip distribution pattern for project-related employee commute and retail sales is shown in **Table 7**. The geographical distribution of trips is based on the relative attractiveness or utility of possible destinations.

The Merced County Association of Governments (MCAG) travel demand model was used to estimate trip distribution percentages. The travel demand model is considered to be a valid source for the trip distribution percentages because it directly addresses:

- the location of destinations of project-related trips,
- the magnitude of land uses that would attract project-related trips, and
- the quality of access to the destinations via the roadway network.

Table 7. Trip Distribution Percentages

Direction and Route	Concrete and Materials Haul Routes	Employees and Retail Sales
Northwest via SR 99	3%	12%
North via Applegate Road	0%	34%
North via Shaffer Road	1%	15%
North via Shaffer Road and Atwater Boulevard	0%	4%
North via Buhach Road	0%	6%
Southeast via SR 99	34%	7%
East via SP Avenue	0%	1%
Land Uses Along Commerce Avenue	0%	5%
South Via Industry Way to Giannini Road and Applegate Road	62%	16%
	100%	100%

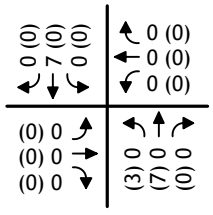
Sources: MCAG Travel Demand Model, and Reed pers. comm.
Note: "SR" = State Route

A "select link" analysis was conducted using the MCAG travel demand model to determine the geographic distribution of project-related travel. The select link analysis identifies vehicle trips associated with the proposed project site, and identifies the direction of travel to and from the project site. Raw, pre-adjustment, traffic model results used in the development of trip distribution percentages are presented in the technical appendix.

TRIP ASSIGNMENT

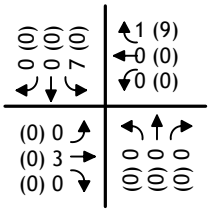
Project-related trips that would be generated by the project, shown in **Table 6**, were distributed over the roadway network using the trip distribution percentages shown in **Table 7**. Haul routes and logical travel routes were used to assign trips to individual roadways. The resulting project-only trips at study intersections is shown in **Figure 6**. The resulting project-only trips at study freeway ramp junctions is shown in **Figure 7**.

1



Applegate Rd/ Sycamore Ave

2



Applegate Rd/ Bell Dr/ Commerce Ave

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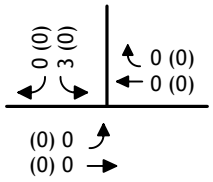

SR 99 SB Ramp/ Bell Dr

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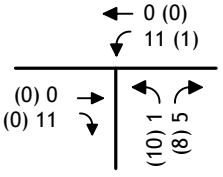
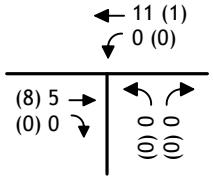


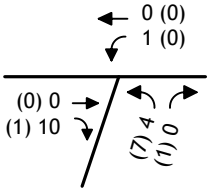
Industry Way/ Commerce Ave

5



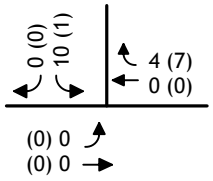
Giannini Rd/ Commerce Ave

6



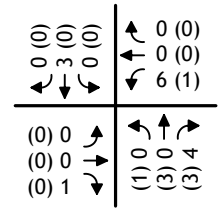
Commerce Ave/ SP Ave

7



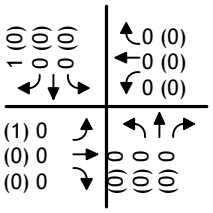
Shaffer Rd/ SP Ave

8



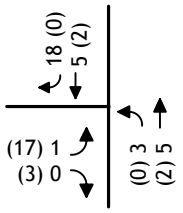
Shaffer Rd/ Atwater Blvd

9



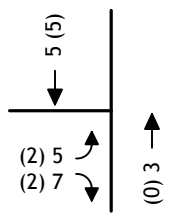
Buhach Rd/ SP Ave

10



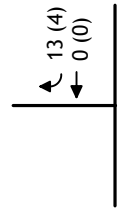
Industry Way/ North Project Site Driveway

11



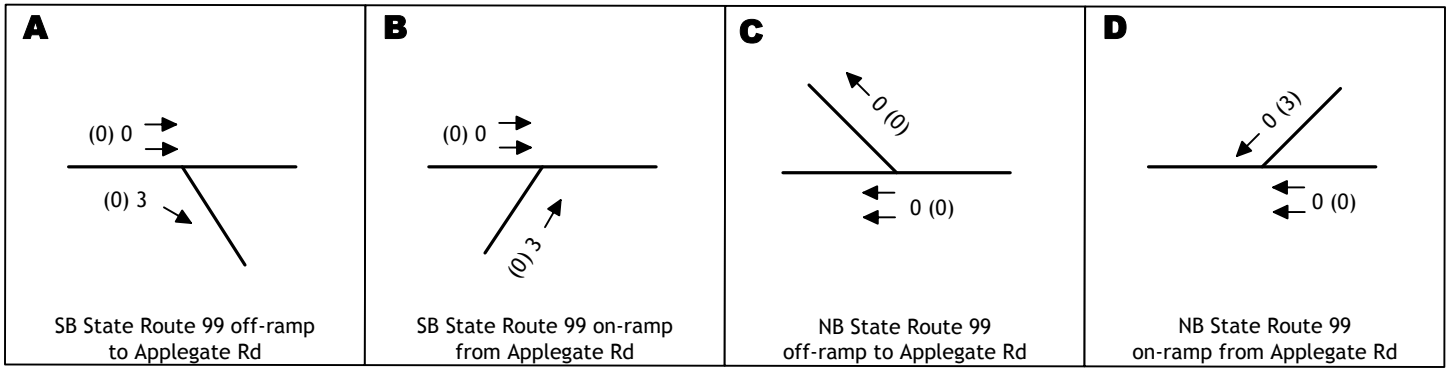
Industry Way/ Central Project Site Driveway

12



Industry Way/ South Project Site Driveway

PROJECT ONLY INTERSECTION TRAFFIC VOLUMES



PROJECT ONLY RAMP JUNCTION TRAFFIC VOLUMES

EXISTING PLUS PROJECT CONDITIONS

This section of this traffic impact study describes the impacts of the Brisco Batch Plant project with near-term existing background conditions.

STUDY INTERSECTIONS

The following describes the impacts of the proposed project on study intersections.

Intersection Traffic Volumes

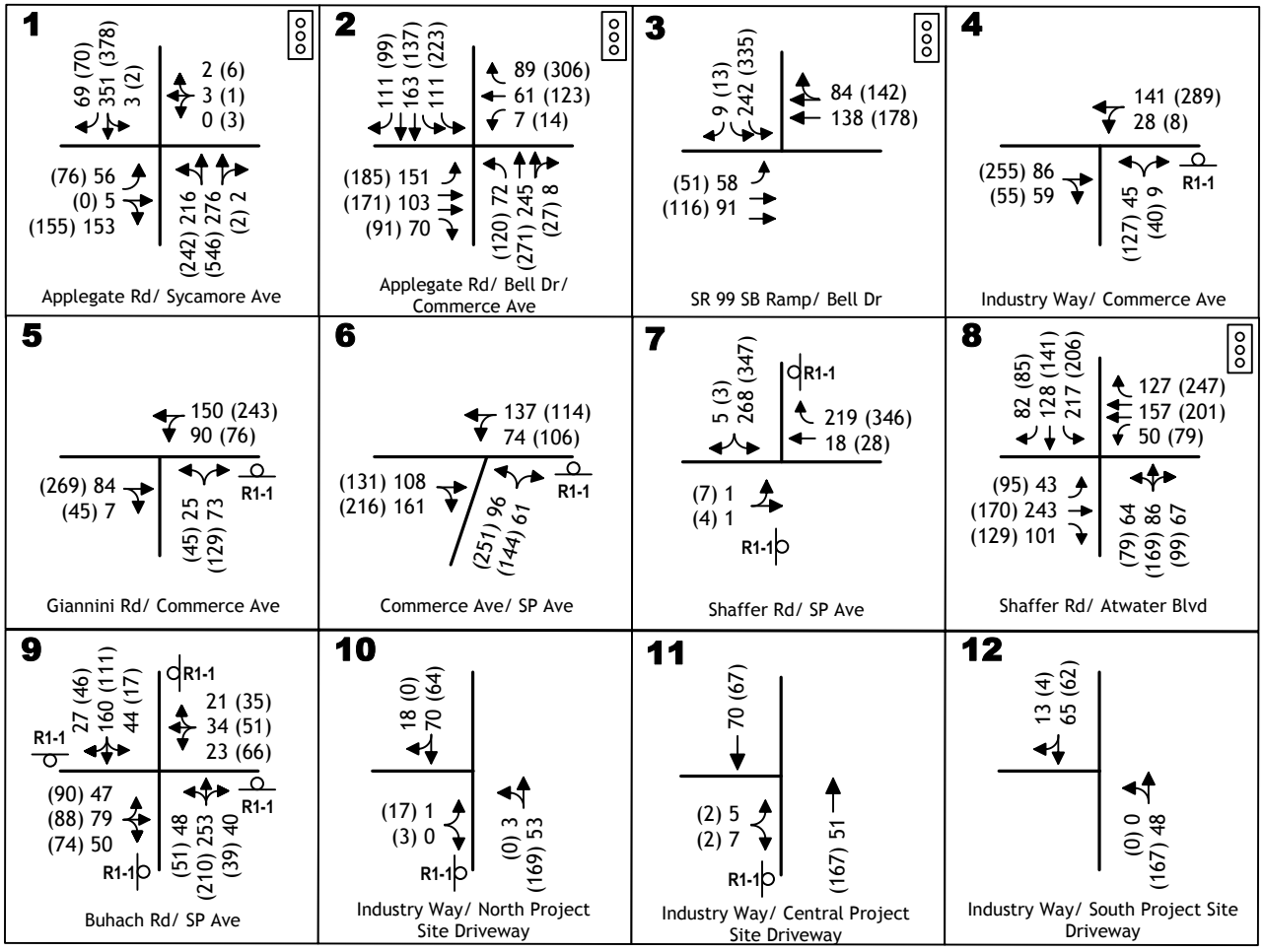
Traffic volumes at study intersections under Existing Plus Project conditions were calculated by adding project-related trips to existing background conditions traffic volumes. Project-related trips shown in **Figure 6** were added to existing traffic volumes shown in **Figure 4**. The resulting Existing Plus Project traffic volumes are shown in **Figure 8**.

Intersection Levels of Service

Peak hour LOS was calculated at the 12 study intersections under Existing Plus Project conditions. Intersection LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 8**. As shown, 11 of the 12 study intersections would operate at acceptable LOS D or better during both the a.m. and p.m. peak hours. The impact of the proposed project on these 11 intersections is considered less-than-significant and no mitigation measures are required at these 11 intersections.

Commerce Avenue & SP Avenue. Under Existing Plus Project conditions, the intersection of Commerce Avenue & SP Avenue would operate at LOS B with 13.8 seconds of delay during the a.m. peak hour and LOS E with 44.1 seconds of delay during the p.m. peak hour. Because LOS E is considered unacceptable and the amount of vehicle delay under Existing Plus Project conditions would be greater than under Existing Conditions, the impact of the project is considered significant. Implementation of the following mitigation measure would reduce this impact to a less-than-significant level.

Mitigation Measure. At the intersection of Commerce Avenue & SP Avenue, split the single lane northbound approach into an exclusive northbound-to-westbound left-turn lane and an exclusive northbound-to-eastbound right-turn lane. As shown in **Table 8**, with implementation of this mitigation measure this intersection would operate at LOS B with 12.6 seconds of delay during the a.m. peak hour and LOS C with 23.1 seconds of delay during the p.m. peak hour. LOS B and C are considered acceptable.



EXISTING PLUS PROJECT INTERSECTION TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

0574-A-01 RA 12/10/2019

figure 8

Table 8. Intersection Level of Service - Existing Plus Project Conditions

	Study Intersections	Inters. Control	Signal Warrant Met?	AM Peak		PM Peak	
				LOS	Delay	LOS	Delay
1	Applegate Road & Sycamore Avenue	Signal		B	16.6	C	22.1
2	Applegate Road & Bell Drive / Commerce Avenue	Signal		C	22.0	C	34.8
3	State Route 99 Southbound Ramps & Bell Drive	Signal		B	12.8	B	12.4
4	Industry Way & Commerce Avenue	Unsig	No	B	10.8	C	17.5
5	Giannini Road & Commerce Avenue	Unsig	No	B	10.3	B	14.5
6	Commerce Avenue & SP Avenue	Unsig	Yes	B	13.8	E	44.1
	With Mitigation Measure	*Unsig*	*Yes*	*B*	*12.6*	*C*	*23.1*
7	Shaffer Road & SP Avenue	Unsig	No	B	13.9	C	16.7
8	Shaffer Road & Atwater Boulevard	Signal		C	20.5	C	29.0
9	Buhach Road & SP Avenue	AWSC	No	B	12.0	B	12.5
10	Industry Way & North Project Site Driveway	Unsig	No	A	9.3	A	9.8
11	Industry Way & Central Project Site Driveway	Unsig	No	A	8.9	A	9.3
12	Industry Way & South Project Site Driveway	Unsig	No	A	<0.1	A	<0.1

Notes: "LOS" = Level of Service. "Inters. Control" = Type of intersection control.
"Signal" = Signalized light control. "Unsig" = Unsignalized stop-sign control. "AWSC" = All-way stop-sign control.
Delay is measured in seconds per vehicle. *Italicized text* indicates conditions with mitigation measure.

This mitigation measure is the same as the recommended improvement for this intersection under Existing Conditions. Because this mitigation measure is also recommended under Existing Conditions, the applicant should be required to pay a proportionate share of the cost for this improvement.

The intersection of Commerce Avenue & SP Avenue would meet the peak hour signal warrant under Existing Plus Project conditions. However, because acceptable LOS can achieve without signalization, installing signalized control at this intersection is not recommended.

STUDY FREEWAY RAMP JUNCTIONS

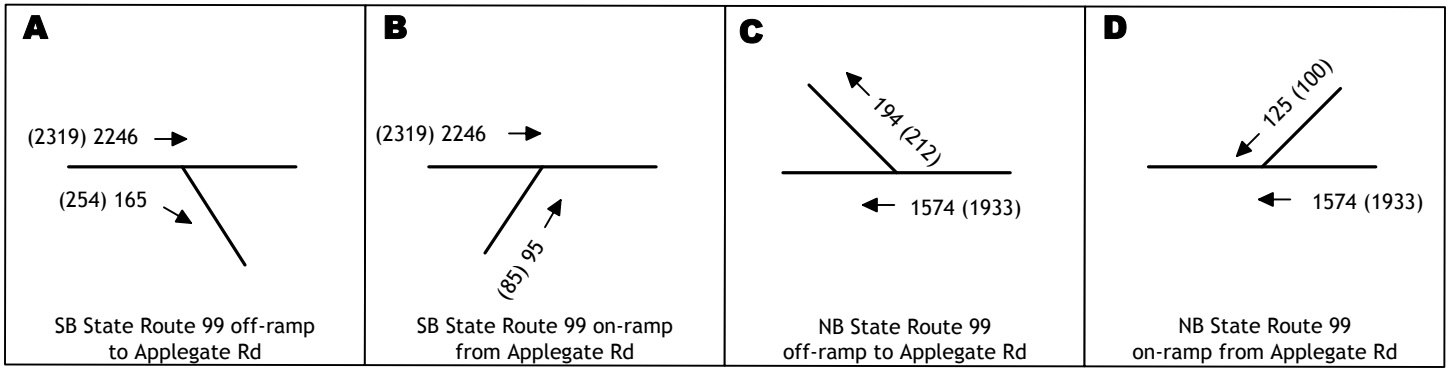
The following describes the impacts of the proposed project on study freeway ramp junctions.

Freeway Ramp Junction Traffic Volumes

Traffic volumes at study ramp junctions under Existing Plus Project conditions were calculated by adding project-related trips to existing background conditions traffic volumes. Project-related trips shown in **Figure 7** were added to existing traffic volumes shown in **Figure 5**. The resulting Existing Plus Project traffic volumes are shown in **Figure 9**.

Freeway Ramp Junction Levels of Service

Peak hour LOS was calculated at the four study freeway ramp junctions under Existing Plus Project conditions. Freeway ramp junction LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 9**. As shown, all four study freeway ramp junctions would operate at acceptable LOS C or better during both the a.m. and p.m. peak hours. The impact of the proposed project on these four freeway ramp junctions is considered less-than-significant and no mitigation measures are required at these four freeway ramp junctions.



EXISTING PLUS PROJECT RAMP JUNCTION TRAFFIC VOLUMES

Table 9. State Route 99 Ramp Merge and Diverge Level of Service - Existing Plus Project Conditions

	Ramp Junction	AM Peak Hour				PM Peak Hour			
		Freeway Volume	Ramp Volume	Density	LOS	Freeway Volume	Ramp Volume	Density	LOS
A	Southbound State Route 99 Off-Ramp to Applegate Road	2,246	165	24.9	C	2,319	254	25.7	C
B	Southbound State Route 99 On-Ramp from Applegate Road	2,246	95	19.1	B	2,319	85	19.7	B
C	Northbound State Route 99 Off-Ramp to Applegate Road	1,574	194	18.2	B	1,933	212	21.8	C
D	Northbound State Route 99 On-Ramp from Applegate Road	1,574	125	14.2	B	1,933	100	17.3	B

Notes: LOS = Level of Service.
Density is expressed in passenger cars per mile per lane.

CUMULATIVE NO PROJECT CONDITIONS

This section of this traffic impact study describes traffic operating conditions under long-term future cumulative conditions without the Brisco Batch Plant project. This scenario provides a description of long-term future background conditions and, in comparison with the Cumulative Plus Project condition, allows identification of project-related impacts under cumulative conditions.

TRAFFIC VOLUME FORECASTS

Future cumulative traffic volume forecasts were prepared for this traffic impact study using the MCAG travel demand forecasting model. The model uses a digitized description of the future roadway network, and a description of future land use disaggregated to traffic analysis zones (TAZs). The future roadway network includes planned roadway improvements (e.g., an initial phase of the Atwater-Merced Expressway [AME]). Future land use includes planned development forecasted for the year 2035.

The current version of the MCAG travel model produces forecasts of daily traffic volumes. The forecasts of daily volumes generated by the travel model are adequate for use in roadway segment daily volume forecasts presented in this traffic impact study. However, the daily volumes generated by the traffic model are not, by themselves, adequate for use in the peak hour LOS analysis of study intersections and study freeway ramp junctions.

Daily traffic volumes from the travel models were used to generate growth factors. These growth factors were applied to existing peak hour intersection turning movement traffic volumes. The development of future year intersection turning movement traffic volumes requires that the turning movements at each intersection "balance". To achieve the balance, inbound traffic volumes must equal the outbound traffic volumes, and the volumes must be distributed among the various left-turn, through, and right-turn movements at each intersection. The "balancing" of future year intersection turning movement traffic volumes was conducted using methods described in the Transportation Research Board's (TRB's) National Cooperative Highway Research Program (NCHRP) Report 255, *Highway Traffic Data for Urbanized Area Project Planning and Design* (Transportation Research Board 1982). The NCHRP 255 method applies the desired peak hour directional volumes to the intersection turning movement volumes, using an iterative process to balance and adjust the resulting forecasts to match the desired peak hour directional volumes.

Application of the methods described above results in long-term future Cumulative No Project peak hour traffic volumes presented in **Figure 10** for study intersections and **Figure 11** for study freeway ramp junctions.

1

168 (165)
384 (431)
5 (4)
3 (12)
6 (3)
0 (4)
(178) 135
(0) 5
(248) 250
(391) 345
(622) 299
(3) 2

Applegate Rd/ Sycamore Ave

2

67 (71)
306 (276)
95 (218)
77 (289)
53 (95)
19 (30)
(142) 93
(142) 93
(156) 133
(185) 129
(528) 448
(56) 22

Applegate Rd/ Bell Dr/ Commerce Ave

3

51 (59)
175 (261)
18 (55)
213 (286)
(118) 110
(196) 164

SR 99 SB Ramp/ Bell Dr

4

249 (546)
20 (13)
(462) 156
(47) 43
(103) 39
(67) 5
R1-1

Industry Way/ Commerce Ave

5

81 (220)
193 (107)
(236) 58
(268) 107
(295) 213
(199) 111
R1-1

Giannini Rd/ Commerce Ave

6

359 (398)
35 (56)
(464) 306
(302) 215
(366) 130
(82) 31
R1-1

Commerce Ave/ SP Ave

7

11 (6)
551 (739)
R1-1
459 (724)
38 (60)
(15) 2
(9) 2
R1-1

Shaffer Rd/ SP Ave

8

90 (97)
287 (329)
334 (297)
190 (365)
190 (236)
111 (187)
(103) 45
(186) 286
(228) 176
(140) 114
(375) 189
(218) 157

Shaffer Rd/ Atwater Blvd

9

R1-1
32 (71)
297 (195)
74 (31)
R1-1
34 (62)
77 (120)
77 (176)
(138) 60
(209) 186
(172) 129
R1-1
(126) 122
(390) 472
(111) 138
R1-1

Buhach Rd/ SP Ave

10

Industry Way/ North Project Site Driveway

11

Industry Way/ Central Project Site Driveway

12

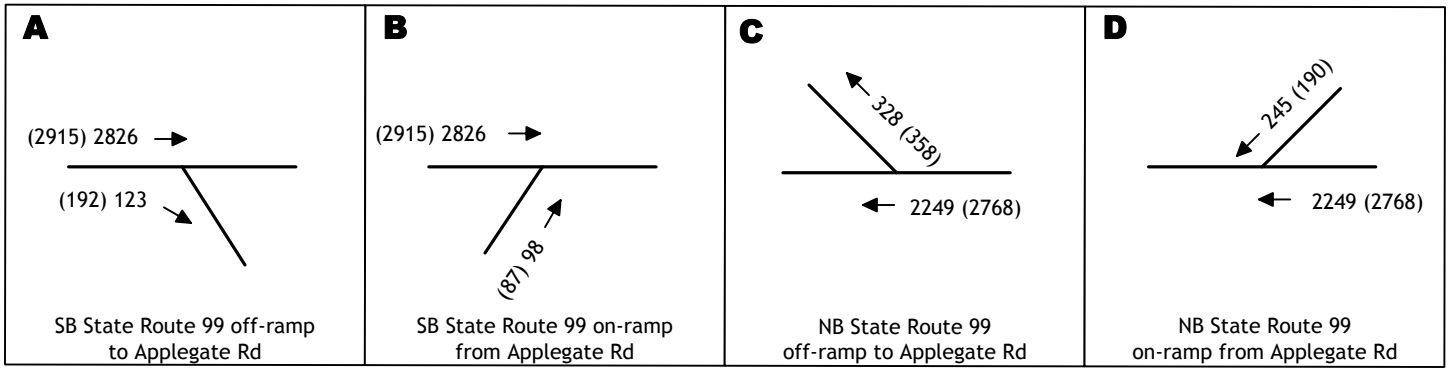
Industry Way/ South Project Site Driveway

CUMULATIVE NO PROJECT INTERSECTION TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

0574-A-01 RA 12/10/2019

figure 10



CUMULATIVE NO PROJECT RAMP JUNCTION TRAFFIC VOLUMES

INTERSECTION LEVELS OF SERVICE

Peak hour LOS were calculated at the nine existing study intersections under Cumulative No Project Conditions. Intersection LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 10**. As shown, two of the nine study intersections would operate at acceptable LOS D or better during both the a.m. and p.m. peak hours. No improvements are recommended at these two intersections.

Applegate Road & Sycamore Avenue

Under Cumulative No Project conditions, the intersection of Applegate Road & Sycamore Avenue would operate at LOS C with 24.8 seconds of delay during the a.m. peak hour and LOS E with 74.7 seconds of delay during the p.m. peak hour. LOS E is considered unacceptable. To improve LOS to an acceptable level, the following improvement is recommended:

Recommended Improvement. At the intersection of Applegate Road & Sycamore Avenue, optimize the timing of the signal control. As shown in **Table 11**, with implementation of this recommended improvement this intersection would operate at LOS C with 30.1 seconds of delay during the a.m. peak hour and LOS D with 43.7 seconds of delay during the p.m. peak hour. LOS C and D are considered acceptable.

Industry Way & Commerce Avenue

Under Cumulative No Project conditions, the intersection of Industry Way & Commerce Avenue would operate at LOS B with 12.3 seconds of delay during the a.m. peak hour and LOS E with 39.1 seconds of delay during the p.m. peak hour. LOS E is considered unacceptable. To improve LOS to an acceptable level, the following improvement is recommended:

Recommended Improvement. At the intersection of Industry Way & Commerce Avenue, split the single lane northbound approach into an exclusive northbound-to-westbound left-turn lane and an exclusive northbound-to-eastbound right-turn lane. As shown in **Table 11**, with implementation of this recommended improvement this intersection would operate at LOS B with 12.2 seconds of delay during the a.m. peak hour and LOS D with 28.5 seconds of delay during the p.m. peak hour. LOS B and D are considered acceptable.

Giannini Road & Commerce Avenue

Under Cumulative No Project conditions, the intersection of Giannini Road & Commerce Avenue would operate at LOS D with 31.8 seconds of delay during the a.m. peak hour and LOS F with 261.4 seconds of delay during the p.m. peak hour. LOS F is considered unacceptable. To improve LOS to an acceptable level, the following improvement is recommended:

Table 10. Intersection Level of Service - Cumulative No Project Conditions

	Study Intersections	Inters. Control	Signal Warrant Met?	AM Peak		PM Peak	
				LOS	Delay	LOS	Delay
1	Applegate Road & Sycamore Avenue	Signal		C	24.8	E	74.7
2	Applegate Road & Bell Drive / Commerce Avenue	Signal		C	22.0	D	41.5
3	State Route 99 Southbound Ramps & Bell Drive	Signal		B	14.1	B	12.8
4	Industry Way & Commerce Avenue	Unsig	No	B	12.3	E	39.1
5	Giannini Road & Commerce Avenue	Unsig	Yes	D	31.8	F	261.4
6	Commerce Avenue & SP Avenue	Unsig	Yes	D	28.9	F	697.9
7	Shaffer Road & SP Avenue	Unsig	Yes	D	30.3	F	85.4
8	Shaffer Road & Atwater Boulevard	Signal		E	61.1	F	196.2
9	Buhach Road & SP Avenue	AWSC	Yes	F	207.1	F	218.8
10	Industry Way & North Project Site Driveway	- -		- -	- -	- -	- -
11	Industry Way & Central Project Site Driveway	- -		- -	- -	- -	- -
12	Industry Way & South Project Site Driveway	- -		- -	- -	- -	- -

Notes: "LOS" = Level of Service. "Inters. Control" = Type of intersection control.
"Signal" = Signalized light control. "Unsig" = Unsignalized stop-sign control. "AWSC" = All-way stop-sign control.
Delay is measured in seconds per vehicle. Dashes ("- -") indicate the intersection would not be present under this scenario.

Table 11. Intersection Level of Service - Cumulative No Project Conditions With Recommended Improvements

	Study Intersections	Inters. Control	AM Peak LOS	AM Peak Delay	PM Peak LOS	PM Peak Delay
1	Applegate Road & Sycamore Avenue	Signal	C	30.1	D	43.7
4	Industry Way & Commerce Avenue	Unsig	B	12.2	D	28.5
5	Giannini Road & Commerce Avenue	AWSC	B	12.0	D	29.9
6	Commerce Avenue & SP Avenue	Signal	B	12.4	C	23.6
7	Shaffer Road & SP Avenue Alternate Recommended Improvement 1	Signal	B	15.3	B	18.5
7	Shaffer Road & SP Avenue Alternate Recommended Improvement 2	Round	A	9.8	C	18.0
8	Shaffer Road & Atwater Boulevard	Signal	D	45.2	F	107.6
9	Buhach Road & SP Avenue	Signal	B	16.7	C	24.0

Notes: "LOS" = Level of Service. "Inters. Control" = Type of intersection control.
"Signal" = Signalized light control. "Unsig" = Unsignalized stop-sign control.
"AWSC" = All-way stop-sign control. "Round" = Roundabout.
Delay is measured in seconds per vehicle.

Recommended Improvement. At the intersection of Giannini Road & Commerce Avenue:

- install all-way stop-control (AWSC) at the intersection, and
- split the single lane eastbound approach into an exclusive eastbound through-turn lane and an exclusive eastbound-to-southbound right-turn lane.

As shown in **Table 11**, with implementation of this recommended improvement this intersection would operate at LOS B with 12.0 seconds of delay during the a.m. peak hour and LOS D with 29.9 seconds of delay during the p.m. peak hour. LOS B and D are considered acceptable.

As shown in **Table 10**, the intersection of Giannini Road & Commerce Avenue would meet the peak hour signal warrant under Cumulative No Project conditions. However, because acceptable LOS can achieve without signalization, installing signalized control at this intersection is not recommended.

Commerce Avenue & SP Avenue

Under Cumulative No Project conditions, the intersection of Commerce Avenue & SP Avenue would operate at LOS D with 28.9 seconds of delay during the a.m. peak hour and LOS F with 697.9 seconds of delay during the p.m. peak hour. LOS F is considered unacceptable. To improve LOS to an acceptable level, the following improvement is recommended:

Recommended Improvement. At the intersection of Giannini Road & Commerce Avenue install signalized control at the intersection. As shown in **Table 10**, this intersection would meet the peak hour signal warrant under Cumulative No Project conditions.

As shown in **Table 11**, with implementation of this recommended improvement this intersection would operate at LOS B with 12.4 seconds of delay during the a.m. peak hour and LOS C with 23.6 seconds of delay during the p.m. peak hour. LOS B and C are considered acceptable.

Shaffer Road & SP Avenue

Under Cumulative No Project conditions, the intersection of Shaffer Road & SP Avenue would operate at LOS D with 30.3 seconds of delay during the a.m. peak hour and LOS F with 85.4 seconds of delay during the p.m. peak hour. LOS F is considered unacceptable. To improve LOS to an acceptable level, it recommended that one of the following two alternate improvements be implemented.

Recommended Improvement. The following two alternate improvements are identified for the intersection of Shaffer Road & SP Avenue. This intersection is located adjacent to railroad tracks and in close proximity to the already-signalized intersection of Shaffer Road & Atwater Boulevard. The railroad tracks and signalized intersection are constraints to the improvement of the intersection of Shaffer Road & SP Avenue. Because of these constraints the alternate improvements are identified in this traffic impact study. Each of the constraints potentially affect

each of the recommended improvements in different ways. It is recommended that the City consider the two alternate improvements and select one for implementation.

Alternate Recommended Improvement 1. At the intersection of Shaffer Road & SP Avenue install signalized control at the intersection. As shown in **Table 10**, this intersection would meet the peak hour signal warrant under Cumulative No Project conditions.

As shown in **Table 11**, with implementation of Alternate Recommended Improvement 1 this intersection would operate at LOS B with 15.3 seconds of delay during the a.m. peak hour and LOS C with 18.5 seconds of delay during the p.m. peak hour. LOS B and C are considered acceptable.

Alternate Recommended Improvement 2. At the intersection of Shaffer Road & SP Avenue install roundabout control at the intersection.

As shown in **Table 11**, with implementation of Alternate Recommended Improvement 2 this intersection would operate at LOS A with 9.8 seconds of delay during the a.m. peak hour and LOS C with 18.0 seconds of delay during the p.m. peak hour. LOS A and C are considered acceptable.

Shaffer Road & Atwater Boulevard

Under Cumulative No Project conditions, the intersection of Shaffer Road & Atwater Boulevard would operate at LOS E with 61.1 seconds of delay during the a.m. peak hour and LOS F with 196.2 seconds of delay during the p.m. peak hour. LOS E and F are considered unacceptable. To improve LOS, but not to an acceptable level, the following improvement is recommended:

Recommended Improvement. At the intersection of Shaffer Road & Atwater Boulevard, optimize the timing of the signal control. As shown in **Table 11**, with implementation of this recommended improvement this intersection would operate at LOS D with 45.2 seconds of delay during the a.m. peak hour and LOS F with 107.6 seconds of delay during the p.m. peak hour. LOS D is considered acceptable. LOS F is considered unacceptable.

Buhach Road & SP Avenue

Under Cumulative No Project conditions, the intersection of Buhach Road & SP Avenue would operate at LOS F with 207.1 seconds of delay during the a.m. peak hour and LOS F with 218.8 seconds of delay during the p.m. peak hour. LOS F is considered unacceptable. To improve LOS to an acceptable level, the following improvement is recommended:

Recommended Improvement. At the intersection of Buhach Road & SP Avenue install signalized control at the intersection. As shown in **Table 10**, this intersection would meet the peak hour signal warrant under Cumulative No Project conditions.

As shown in **Table 11**, with implementation of this recommended improvement this intersection would operate at LOS B with 16.7 seconds of delay during the a.m. peak hour and LOS C with 24.0 seconds of delay during the p.m. peak hour. LOS B and C are considered acceptable.

FREEWAY RAMP JUNCTION LEVELS OF SERVICE

Peak hour LOS was calculated at the four existing study freeway ramp junctions under Cumulative No Project conditions. Ramp junction LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 12**. As shown, all four study ramp junctions would operate at LOS D or better during both the a.m. peak hour and p.m. peak hour. No improvements are recommended at these four freeway ramp junctions.

Table 12. State Route 99 Ramp Merge and Diverge Level of Service - Cumulative No Project Conditions

	Ramp Junction	AM Peak Hour				PM Peak Hour			
		Freeway Volume	Ramp Volume	Density	LOS	Freeway Volume	Ramp Volume	Density	LOS
A	Southbound State Route 99 Off-Ramp to Applegate Road	2,826	123	30.8	D	2,915	192	31.7	D
B	Southbound State Route 99 On-Ramp from Applegate Road	2,826	98	24.4	C	2,915	87	25.2	C
C	Northbound State Route 99 Off-Ramp to Applegate Road	2,249	328	25.0	C	2,768	358	30.2	D
D	Northbound State Route 99 On-Ramp from Applegate Road	2,249	245	21.3	C	2,768	190	25.6	C

Notes: LOS = Level of Service.
Density is expressed in passenger cars per mile per lane.

CUMULATIVE PLUS PROJECT CONDITIONS

This section of this traffic impact study describes the impacts of the Brisco Batch Plant project with long-term future cumulative background conditions.

TRAFFIC VOLUMES

Traffic volumes under Cumulative Plus Project conditions were calculated by adding project-related trips to Cumulative No Project background conditions traffic volumes.

At study intersections, project-related trips shown in **Figure 6** were added to cumulative background traffic volumes shown in **Figure 10**. The resulting Cumulative Plus Project traffic volumes at study intersections are shown in **Figure 12**.

At study freeway ramp junctions, project-related trips shown in **Figure 7** were added to cumulative background traffic volumes shown in **Figure 11**. The resulting Cumulative Plus Project traffic volumes at study freeway ramp junctions are shown in **Figure 13**.

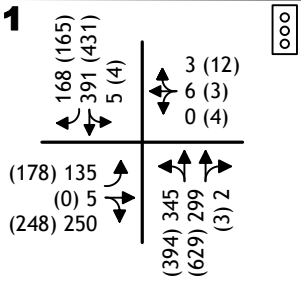
INTERSECTION LEVELS OF SERVICE

The following describes the impacts of the proposed project on study intersections. Peak hour LOS was calculated at the 12 study intersections under Cumulative Plus Project conditions. Intersection LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 13**. As shown, five of the 12 study intersections would operate at acceptable LOS D or better during both the a.m. and p.m. peak hours. The impact of the proposed project on these five intersections is considered less-than-significant and no mitigation measures are required at these five intersections.

Applegate Road & Sycamore Avenue

Under Cumulative Plus Project conditions, the intersection of Applegate Road & Sycamore Avenue would operate at LOS C with 25.2 seconds of delay during the a.m. peak hour and LOS E with 77.2 seconds of delay during the p.m. peak hour. Because LOS E is considered unacceptable and the amount of vehicle delay under Cumulative Plus Project conditions would be greater than under Cumulative No Project Conditions, the impact of the project is considered significant. Implementation of the following mitigation measure would reduce this impact to a less-than-significant level.

1



Applegate Rd/ Sycamore Ave

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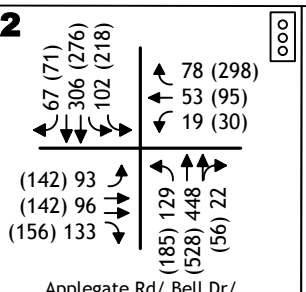

Applegate Rd/ Bell Dr/ Commerce Ave

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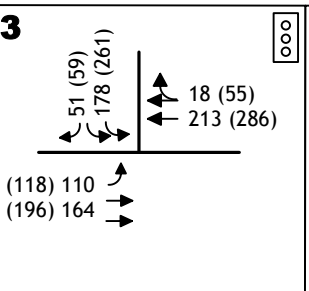

SR 99 SB Ramp/ Bell Dr

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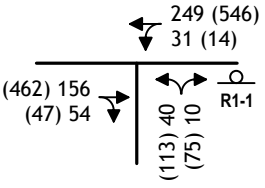
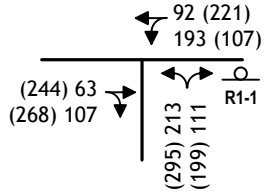


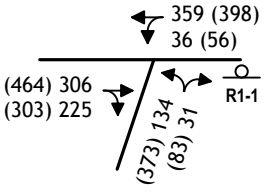
Industry Way/ Commerce Ave

5



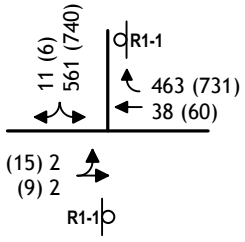
Giannini Rd/ Commerce Ave

6



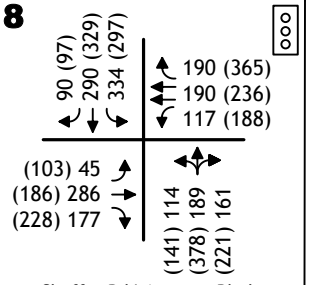
Commerce Ave/ SP Ave

7



Shaffer Rd/ SP Ave

8



Shaffer Rd/ Atwater Blvd

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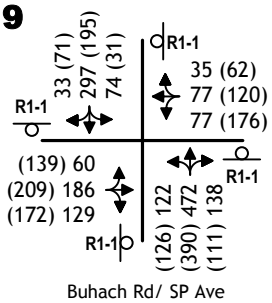

Buhach Rd/ SP Ave

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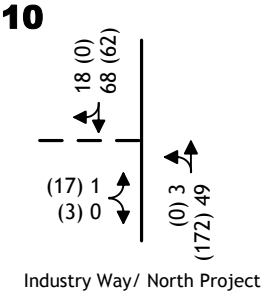
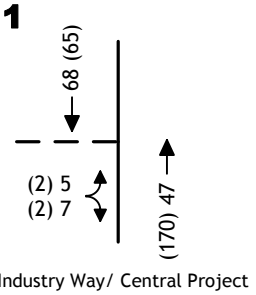


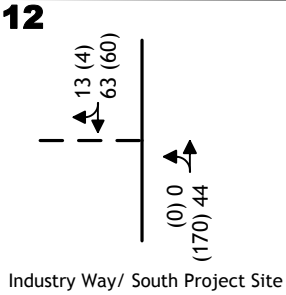
Industry Way/ North Project Site Driveway

11



Industry Way/ Central Project Site Driveway

12



Industry Way/ South Project Site Driveway

CUMULATIVE PLUS PROJECT INTERSECTION TRAFFIC VOLUMES AND LANE CONFIGURATIONS

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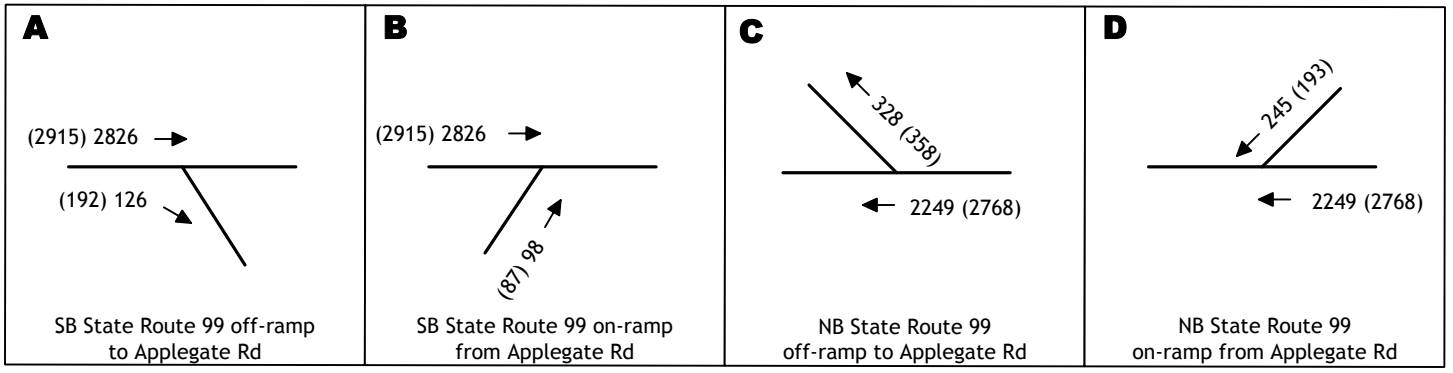

CUMULATIVE PLUS PROJECT RAMP JUNCTION TRAFFIC VOLUMES

Table 13. Intersection Level of Service - Cumulative Plus Project Conditions

	Study Intersections	Inters. Control	Signal Warrant Met?	AM Peak		PM Peak	
				LOS	Delay	LOS	Delay
1	Applegate Road & Sycamore Avenue	Signal		C	25.2	E	77.2
2	Applegate Road & Bell Drive / Commerce Avenue	Signal		C	22.1	D	42.5
3	State Route 99 Southbound Ramps & Bell Drive	Signal		B	14.1	B	12.8
4	Industry Way & Commerce Avenue	Unsig	No	B	12.5	E	44.9
5	Giannini Road & Commerce Avenue	Unsig	Yes	D	33.9	F	270.7
6	Commerce Avenue & SP Avenue	Unsig	Yes	D	30.1	F	717.1
7	Shaffer Road & SP Avenue	Unsig	Yes	D	31.4	F	85.4
8	Shaffer Road & Atwater Boulevard	Signal		E	63.4	F	199.7
9	Buhach Road & SP Avenue	AWSC	Yes	F	207.6	F	219.2
10	Industry Way & North Project Site Driveway	Unsig	No	A	9.3	A	9.8
11	Industry Way & Central Project Site Driveway	Unsig	No	A	8.9	A	9.3
12	Industry Way & South Project Site Driveway	Unsig	No	A	<0.1	A	<0.1

Notes: "LOS" = Level of Service. "Inters. Control" = Type of intersection control.
"Signal" = Signalized light control. "Unsig" = Unsignalized stop-sign control. "AWSC" = All-way stop-sign control.
Delay is measured in seconds per vehicle.

Mitigation Measure. At the intersection of Applegate Road & Sycamore Avenue, optimize the timing of the signal control. As shown in **Table 14**, with implementation of this mitigation measure this intersection would operate at LOS C with 30.6 seconds of delay during the a.m. peak hour and LOS D with 44.2 seconds of delay during the p.m. peak hour. LOS C and D are considered acceptable.

This mitigation measure is the same as the recommended improvement for this intersection under Cumulative No Project Conditions. Because this mitigation measure is also recommended under Cumulative No Project Conditions, the applicant should be required to pay a proportionate share of the cost for this improvement.

Industry Way & Commerce Avenue

Under Cumulative Plus Project conditions, the intersection of Industry Way & Commerce Avenue would operate at LOS B with 12.5 seconds of delay during the a.m. peak hour and LOS E with 44.9 seconds of delay during the p.m. peak hour. Because LOS E is considered unacceptable and the amount of vehicle delay under Cumulative Plus Project conditions would be greater than under Cumulative No Project Conditions, the impact of the project is considered significant. Implementation of the following mitigation measure would reduce this impact to a less-than-significant level.

Mitigation Measure. At the intersection of Industry Way & Commerce Avenue, split the single lane northbound approach into an exclusive northbound-to-westbound left-turn lane and an exclusive northbound-to-eastbound right-turn lane. As shown in **Table 14**, with implementation of this mitigation measure this intersection would operate at LOS B with 12.3 seconds of delay during the a.m. peak hour and LOS D with 30.5 seconds of delay during the p.m. peak hour. LOS B and D are considered acceptable.

This mitigation measure is the same as the recommended improvement for this intersection under Cumulative No Project Conditions. Because this mitigation measure is also recommended under Cumulative No Project Conditions, the applicant should be required to pay a proportionate share of the cost for this improvement.

Giannini Road & Commerce Avenue

Under Cumulative Plus Project conditions, the intersection of Giannini Road & Commerce Avenue would operate at LOS D with 33.9 seconds of delay during the a.m. peak hour and LOS F with 270.7 seconds of delay during the p.m. peak hour. Because LOS F is considered unacceptable and the amount of vehicle delay under Cumulative Plus Project conditions would be greater than under Cumulative No Project Conditions, the impact of the project is considered significant. Implementation of the following mitigation measure would reduce this impact to a less-than-significant level.

Table 14. Intersection Level of Service - Cumulative Plus Project Conditions With Mitigation Measures

	Study Intersections	Inters. Control	AM Peak LOS	AM Peak Delay	PM Peak LOS	PM Peak Delay
1	Applegate Road & Sycamore Avenue	Signal	C	30.6	D	44.2
4	Industry Way & Commerce Avenue	Unsig	B	12.3	D	30.5
5	Giannini Road & Commerce Avenue	AWSC	B	12.4	D	30.2
6	Commerce Avenue & SP Avenue	Signal	B	18.8	B	18.2
7	Shaffer Road & SP Avenue Alternate Mitigation Measure 1	Signal	B	12.8	C	21.2
7	Shaffer Road & SP Avenue Alternate Mitigation Measure 2	Round	A	10.0	C	18.3
8	Shaffer Road & Atwater Boulevard	Signal	D	44.9	F	87.2
9	Buhach Road & SP Avenue	Signal	B	16.7	B	18.5

Notes: "LOS" = Level of Service. "Inters. Control" = Type of intersection control.
"Signal" = Signalized light control. "Unsig" = Unsignalized stop-sign control.
"AWSC" = All-way stop-sign control. "Round" = Roundabout.
Delay is measured in seconds per vehicle.

Mitigation Measure. At the intersection of Giannini Road & Commerce Avenue:

- install AWSC at the intersection, and
- split the single lane eastbound approach into an exclusive eastbound through-turn lane and an exclusive eastbound-to-southbound right-turn lane.

As shown in **Table 14**, with implementation of this mitigation measure this intersection would operate at LOS B with 12.4 seconds of delay during the a.m. peak hour and LOS D with 30.2 seconds of delay during the p.m. peak hour. LOS B and D are considered acceptable.

This mitigation measure is the same as the recommended improvement for this intersection under Cumulative No Project Conditions. Because this mitigation measure is also recommended under Cumulative No Project Conditions, the applicant should be required to pay a proportionate share of the cost for this improvement.

As shown in **Table 13**, the intersection of Giannini Road & Commerce Avenue would meet the peak hour signal warrant under Cumulative Plus Project conditions. However, because acceptable LOS can achieve without signalization, installing signalized control at this intersection is not recommended.

Commerce Avenue & SP Avenue

Under Cumulative Plus Project conditions, the intersection of Commerce Avenue & SP Avenue would operate at LOS D with 30.1 seconds of delay during the a.m. peak hour and LOS F with 717.1 seconds of delay during the p.m. peak hour. Because LOS F is considered unacceptable and the amount of vehicle delay under Cumulative Plus Project conditions would be greater than under Cumulative No Project Conditions, the impact of the project is considered significant. Implementation of the following mitigation measure would reduce this impact to a less-than-significant level.

Mitigation Measure. At the intersection of Giannini Road & Commerce Avenue install signalized control at the intersection. As shown in **Table 13**, this intersection would meet the peak hour signal warrant under Cumulative Plus Project conditions.

As shown in **Table 14**, with implementation of this mitigation measure this intersection would operate at LOS B with 12.4 seconds of delay during the a.m. peak hour and LOS C with 30.2 seconds of delay during the p.m. peak hour. LOS B and C are considered acceptable.

This mitigation measure is the same as the recommended improvement for this intersection under Cumulative No Project Conditions. Because this mitigation measure is also recommended under Cumulative No Project Conditions, the applicant should be required to pay a proportionate share of the cost for this improvement.

Shaffer Road & SP Avenue

Under Cumulative Plus Project conditions, the intersection of Shaffer Road & SP Avenue would operate at LOS D with 31.4 seconds of delay during the a.m. peak hour and LOS F with 85.4 seconds of delay during the p.m. peak hour. Because LOS F is considered unacceptable and the amount of vehicle delay under Cumulative Plus Project conditions would be greater than under Cumulative No Project Conditions, the impact of the project is considered significant. Implementation of the following mitigation measure would reduce this impact to a less-than-significant level.

Mitigation Measure. The following two alternate mitigation measures are identified for the intersection of Shaffer Road & SP Avenue. This intersection is located adjacent to railroad tracks and in close proximity to the already-signalized intersection of Shaffer Road & Atwater Boulevard. The railroad tracks and signalized intersection are constraints to the improvement of the intersection of Shaffer Road & SP Avenue. Because of these constraints the alternate mitigation measures are identified in this traffic impact study. Each of the constraints potentially affect each of the mitigation measures in different ways. It is recommended that the City consider the two alternate mitigation measures and select one for implementation.

Alternate Mitigation Measure 1. At the intersection of Shaffer Road & SP Avenue install signalized control at the intersection. As shown in **Table 13**, this intersection would meet the peak hour signal warrant under Cumulative Plus Project conditions.

As shown in **Table 14**, with implementation of Alternate Mitigation Measure 1 this intersection would operate at LOS B with 12.8 seconds of delay during the a.m. peak hour and LOS C with 21.2 seconds of delay during the p.m. peak hour. LOS B and C are considered acceptable.

Alternate Mitigation Measure 2. At the intersection of Shaffer Road & SP Avenue install roundabout control at the intersection.

As shown in **Table 14**, with implementation of Alternate Mitigation Measure 2 this intersection would operate at LOS A with 10.0 seconds of delay during the a.m. peak hour and LOS C with 18.3 seconds of delay during the p.m. peak hour. LOS A and C are considered acceptable.

Both of the alternate mitigation measures are the same as the alternate recommended improvements for this intersection under Cumulative No Project Conditions. Because the mitigation measures are also recommended under Cumulative No Project Conditions, the applicant should be required to pay a proportionate share of the cost for this improvement.

Shaffer Road & Atwater Boulevard

Under Cumulative Plus Project conditions, the intersection of Shaffer Road & Atwater Boulevard would operate at LOS E with 63.4 seconds of delay during the a.m. peak hour and LOS F with 199.7 seconds of delay during the p.m. peak hour. Because LOS E and F are

considered unacceptable and the amount of vehicle delay under Cumulative Plus Project conditions would be greater than under Cumulative No Project Conditions, the impact of the project is considered significant. Implementation of the following mitigation measure would reduce this impact to a less-than-significant level.

Mitigation Measure. At the intersection of Shaffer Road & Atwater Boulevard:

- optimize the timing of the signal control; and
- implement overlap timing on the westbound-to-northbound right-turn movement, which would require prohibiting southbound-to-northbound U-turn movements.

As shown in **Table 14**, with implementation of this mitigation measure this intersection would operate at LOS D with 44.9 seconds of delay during the a.m. peak hour and LOS F with 87.2 seconds of delay during the p.m. peak hour. LOS D is considered acceptable. LOS F is considered unacceptable. However, the amount of delay during the p.m. peak hour would be less than delay during the p.m. peak hour under Cumulative No Project conditions. Because delay under Cumulative Plus Project conditions with the mitigation measure would be less than delay under Cumulative No Project, the mitigation measure is considered to reduce the impact to a less than significant level.

Buhach Road & SP Avenue

Under Cumulative Plus Project conditions, the intersection of Buhach Road & SP Avenue would operate at LOS F with 207.6 seconds of delay during the a.m. peak hour and LOS F with 219.2 seconds of delay during the p.m. peak hour. Because LOS F is considered unacceptable and the amount of vehicle delay under Cumulative Plus Project conditions would be greater than under Cumulative No Project Conditions, the impact of the project is considered significant. Implementation of the following mitigation measure would reduce this impact to a less-than-significant level.

Mitigation Measure. At the intersection of Buhach Road & SP Avenue install signalized control at the intersection. As shown in **Table 13**, this intersection would meet the peak hour signal warrant under Cumulative Plus Project conditions.

As shown in **Table 14**, with implementation of this mitigation measure this intersection would operate at LOS B with 16.7 seconds of delay during the a.m. peak hour and LOS C with 18.5 seconds of delay during the p.m. peak hour. LOS B and C are considered acceptable.

This mitigation measure is the same as the recommended improvement for this intersection under Cumulative No Project Conditions. Because this mitigation measure is also recommended under Cumulative No Project Conditions, the applicant should be required to pay a proportionate share of the cost for this improvement.

FREEWAY RAMP JUNCTION LEVELS OF SERVICE

The following describes the impacts of the proposed project on study freeway ramp junction. Peak hour LOS was calculated at the four study freeway ramp junctions under Cumulative Plus Project conditions. Freeway ramp junction LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 15**. As shown, all four of the study freeway ramp junction would operate at acceptable LOS D or better during both the a.m. and p.m. peak hours. The impact of the proposed project on these four freeway ramp junctions is considered less-than-significant and no mitigation measures are required at these four freeway ramp junctions.

Table 15. State Route 99 Ramp Merge and Diverge Level of Service - Cumulative Plus Project Conditions

	Ramp Junction	AM Peak Hour				PM Peak Hour			
		Freeway Volume	Ramp Volume	Density	LOS	Freeway Volume	Ramp Volume	Density	LOS
A	Southbound State Route 99 Off-Ramp to Applegate Road	2,826	126	30.8	D	2,915	192	31.7	D
B	Southbound State Route 99 On-Ramp from Applegate Road	2,826	98	24.4	C	2,915	87	25.2	C
C	Northbound State Route 99 Off-Ramp to Applegate Road	2,249	328	25.0	C	2,768	358	30.2	D
D	Northbound State Route 99 On-Ramp from Applegate Road	2,249	245	21.3	C	2,768	193	25.6	C

Notes: LOS = Level of Service.
Density is expressed in passenger cars per mile per lane.

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PERSONAL COMMUNICATIONS

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TECHNICAL APPENDIX

(in separate electronic file)