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Traffic Analysis

Sleeping Lady Winery P15-00423-UP
Planning Commission Hearing December 7, 2016

August 3, 2016

Mr. Brion G. Wise
Sleeping Lady Vineyard
35 East Napa Street, Suite B
Sonoma, CA 95476

Traffic Analysis for Sleeping Lady Vineyard

Dear Mr. Wise;

As requested, W-Trans has prepared a traffic analysis relative to the proposed winery and tasting-by-appointment facility to be located at 5537 Solano Avenue in the County of Napa. The purpose of this letter is to address the potential impacts of project-added trips on the roadway network.

Existing Conditions

The study area consists of Solano Avenue, which runs along the frontage of the project site in the County of Napa. Solano Avenue runs generally north-south and is classified as a collector. Along the project frontage, the road has two 12-foot travel lanes. Traffic counts obtained on Solano Avenue between April 14 and 17, 2015, indicate that the roadway is carrying about 1,800 to 2,200 vehicles per day, and the average ADT is 1,930.

Project Description

The proposed project is a new 30,000-gallon per year winery to be located on a 104-acre parcel of land located at 5537 Solano Avenue in the County of Napa. There are two existing residences on the project site (a single family dwelling and a caretaker unit) together with a vineyard. The proposal is to restore and convert a historic barn structure for re-use as a winery producing wine from the fruit grown on-site rather than exporting it. In addition to the winery uses, a hospitality/tasting area within the winery is proposed that would serve 20 visitors on a peak day and 105 guests per week, or an average of 15 visitors per day by appointment only. The winery will have two full-time and two part-time employees during normal operation and two additional part-time employees during harvest. The tasting room will be open seven days per week. Production times as proposed would range from 6:00 a.m. to 6:00 p.m. while tasting hours would be from 10:00 a.m. until 6:00 p.m. Finally, ten winery marketing events per year with up to 30 persons attending are proposed together with two release or wine club events per year with up to 75 persons attending as well as an NVAA event with up to 100 attendees. Events would commence at 6:00 p.m. or later and conclude by 10:00 p.m. Permanent parking for seven vehicles is proposed.

Trip Generation

The County of Napa's Winery Traffic Information/Trip Generation Sheet was used to determine the trip generation for the project proposed. To provide a conservative assessment the peak day visitation was used rather than the average number of daily guests. The County of Napa's Winery Traffic Information/Trip Generation Sheet does not include guidance on inbound versus outbound trips during the peak hours, so it was assumed that two-thirds of trip ends at the winery would be outbound during the weekday p.m. peak hour since most of the trips would be associated with employees and customers leaving at closure of the winery. For the Saturday peak hour it was assumed that inbound and outbound trip ends would be evenly split. The net new trips for the proposed project are shown in Table 1 and a copy of the trip generation worksheet is enclosed.

Table 1 – Trip Generation Summary

Trip Source	Daily		Weekday PM Peak Hour			Weekend MD Peak Hour			Crush Saturday Peak Hour		
	Weekday	Weekend	Trips	In	Out	Trips	In	Out	Trips	In	Out
Employees	10	10	4	1	3	4	2	2	6	3	3
Visitors	15	14	6	3	3	10	5	5	11	5	6
Trucks	1	0	0	0	0	0	0	0	1	1	0
Total	**26**	**24**	**10**	**4**	**6**	**14**	**7**	**7**	**18**	**9**	**9**

Note: Trip generation as estimated above does not include special events

Trip Distribution

Traffic counts obtained on Solano Avenue in 2015 indicate that during the p.m. peak hour traffic volumes southbound are about double those northbound. Over the course of the day and midday, however, volumes are fairly evenly split. Given the volume pattern on Solano Avenue as well as the proximity to protected access to SR 29 either at California Drive in Yountville to the north or Oak Knoll Avenue to the south, it appears likely that project trips will be fairly evenly split, so a 50/50 distribution to the north and south is suggested. While inbound trips will be assigned via Hoffman Lane, it is likely that all outbound trips during peak periods will divert to locations where protected access to the highway is provided.

Roadway Segment Level of Service Methodology

The roadway segment Level of Service methodology found in Chapter 15, "Two-Lane Highways," of the *Highway Capacity Manual* is the basis of the automobile LOS analysis. The methodology considers traffic volumes, terrain, roadway cross-section, the proportion of heavy vehicles, and the availability of passing zones. The LOS criteria for two-lane highways differs depending on whether the highway is considered "Class I", "Class II", or "Class III". Class I highways are typically long-distance routes connecting major traffic generators or national highway networks where motorists expect to travel at high speeds. Motorists do not necessarily expect to travel at high speeds on Class II highways, which often function as scenic or recreational routes and typically serve shorter trips. Class III highways may be portions of Class I or Class II highways that pass through towns and communities and have a mix of local traffic and through traffic.

Solano Avenue was defined as a Class III roadway for the purposes of this analysis. Class III highways are measured by percent of free-flow speed (PFFS), which represents the ability of vehicles to travel at or near the posted speed limit. A PFFS greater than 91.7 percent is indicative of LOS A conditions.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the weekday p.m. and weekend midday peak periods. Volume data was collected in April 2015.

The existing and existing plus project traffic volumes on Solano Avenue are summarized in Table 2. The weekend midday peak was evaluated with the trips associated with Crush Saturdays, resulting in a more conservative analysis.

Table 2 – Existing and Existing plus Project Traffic Volumes near 5537 Solano Avenue

Existing Conditions				Existing plus Project			
PM Peak		Weekend Midday Peak		PM Peak		Weekend Midday Peak	
NB	SB	NB	SB	NB	SB	NB	SB
94	119	74	106	97	121	78	111

Notes: NB = Northbound; SB = Southbound

Roadway Segment Levels of Service

Under existing conditions, the roadway operates acceptably at LOS A during both peak periods in either direction. The roadway is expected to continue to operate at LOS A during both peak periods upon the addition of project added traffic. A summary of the roadway segment level of service calculations is shown in Table 3, and copies of the Level of Service calculations are enclosed.

Table 3 – Existing and Existing plus Project Peak Hour Intersection Levels of Service on Solano Avenue

Existing Conditions								Existing plus Project							
PM Peak				Weekend Midday Peak				PM Peak				Weekend Midday Peak			
NB		SB		NB		SB		NB		SB		NB		SB	
PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS
95.1%	A	95.6%	A	94.6%	A	96.1%	A	94.9%	A	95.4%	A	95.2%	A	95.9%	A

Notes: NB = Northbound; SB = Southbound; PFFS = Percent Free Flow Speed; LOS = Level of Service

It should be noted that with the addition of project-related traffic volumes, the Percent Free Flow Speed decreases during both peak hours except for the southbound direction during the p.m. peak hour. This reflects the expected condition wherein having slightly more traffic results in a slightly increased potential for drivers to have their speed dictated by another driver in front of them. While the slight increase in the southbound PFFS during the p.m. peak hour is counter-intuitive, this result is likely due to rounding within the software that falls in one direction for existing volumes and the other direction for plus project. The conclusion could incorrectly be drawn that the project actually improves operation based on this data alone; however, it is more appropriate to conclude that drivers will experience little, if any, change in conditions as a result of the project.

Finding – The study segment is expected to continue operating acceptably at LOS A during both peak periods upon the addition of project-generated traffic to existing volumes.

Cumulative Conditions

Cumulative operating conditions were determined by adding trips that will be generated by other approved and pending projects to the segment of Solano Avenue in the vicinity of Sleeping Lady Vineyard to existing volumes. As directed by County staff, the following projects were included to evaluate Cumulative Conditions.

- **Chanticleer Winery** – new winery with 10,000 gallons of production and tasting by appointments only at 4 Vineyard View Drive
- **McVicar Winery** – new winery to be located at 6155 Solano Avenue, proposing 20,000 gallons of production
- **Burgess Napa Cellars** – winery with 75,000 gallons of production at 5445 Solano Avenue

- **Darms Lane** – new winery producing 30,000 gallons of wine and tasting by appointments only at 1150 Darms Lane
- **Oak Knoll Hotel** – 50-room hotel at 5091 Saint Helena Highway

The traffic volumes on the study segment under cumulative and cumulative plus project conditions are summarized in Table 4. Some visitors to Sleeping Lady Vineyard would be expected to visit multiple wineries during their time in Napa Valley, including those wineries included in the list of approved projects, but all of these trips were conservatively added as if single-purpose new trips.

Table 4 – Cumulative and Cumulative plus Project Traffic Volumes near 5537 Solano Avenue

Cumulative Conditions				Cumulative plus Project			
PM Peak		Weekend Midday Peak		PM Peak		Weekend Midday Peak	
NB	SB	NB	SB	NB	SB	NB	SB
111	129	92	123	114	131	96	128

Notes: NB = Northbound; SB = Southbound

Under cumulative conditions, Solano Avenue is expected to operate acceptably at LOS A in either direction, with or without project-added trips, as shown in Table 5.

Table 5 – Cumulative and Cumulative plus Project Peak Hour Intersection LOS on Solano Avenue

Cumulative Conditions								Cumulative plus Project							
PM Peak				Weekend Midday Peak				PM Peak				Weekend Midday Peak			
NB		SB		NB		SB		NB		SB		NB		SB	
PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS
94.4%	A	94.8%	A	94.4%	A	95.1%	A	94.2%	A	94.6%	A	94.1%	A	94.9%	A

Notes: LOS = Level of Service; PFFS = Percent Free Flow Speed; LOS = Level of Service

Finding – The study segment is expected to continue operating acceptably at LOS A during both peak periods upon the addition of traffic associated with the project as well as other approved and pending projects.

Future Conditions

Segment volumes for the horizon year of 2030 were obtained from the County's gravity demand model. There is no information for Solano Avenue in the vicinity of the project site, so a growth factor of 1.37 was calculated based on 2010 and 2030 model volumes for SR 29 and applied to existing volumes to arrive at future volumes.

Table 6 shows the projected future and future plus traffic volumes on Solano Avenue near the project site achieved through application of the growth factor.

Table 6 – Future and Future plus Project Traffic Volumes near 5537 Solano Avenue

Future Conditions				Future plus Project			
PM Peak		Weekend Midday Peak		PM Peak		Weekend Midday Peak	
NB	SB	NB	SB	NB	SB	NB	SB
128	162	101	145	131	164	105	150

Notes: NB = Northbound; SB = Southbound

Under projected future volumes, the roadway study segment is expected to operate acceptably at LOS A during both peak periods and in either direction, with or without the addition of project-generated traffic. These results are summarized in Table 7.

Table 7 – Future and Future plus Project Peak Hour Intersection Levels of Service on Solano Avenue

Future Conditions								Future plus Project							
PM Peak				Weekend Midday Peak				PM Peak				Weekend Midday Peak			
NB		SB		NB		SB		NB		SB		NB		SB	
PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS	PFFS	LOS
92.7%	A	93.5%	A	93.3%	A	94.3%	A	92.5%	A	93.3%	A	93.0%	A	94.1%	A

Notes: LOS = Level of Service; PFFS = Percent Free Flow Speed; LOS = Level of Service

Finding – The study segment is expected to continue operating acceptably at LOS A in both directions during both peak periods with project traffic added to potential Future volumes.

Project Impact to SR 29 Intersections

Further analysis was completed to determine if the project would have a significant impact on SR 29 using Napa County's Guidelines for Interpretation of General Plan Circulation Policies on Significance Criteria, published on December 1, 2015 by Fehr & Peers. The document establishes thresholds of significance for road segments and different intersection control types. The memorandum states a project would cause a significant impact requiring mitigation if, for existing conditions: *An unsignalized intersection operates at LOS A, B, C, or D during the selected peak hours without Project trips, the LOS deteriorates to LOS E or F with the addition of Project traffic, and the peak hour traffic signal warrant criteria is met.*

As noted in the trip distribution, it was assumed that the only trips at SR 29/Hoffman Avenue would be inbound, southbound right-turns, which would be expected to have an imperceptible impact on operation of SR 29/ Hoffman Avenue. All other visitors and employees would access the project site from intersections with protected access to the highway which are located to the north at California Avenue and south at Oak Knoll Avenue. Because the project is expected to add trips only to movements that have little to no delay and none to the critical left-turn movements, the impact on operation is expected to be less-than-significant.

Further, a project would cause a significant impact requiring mitigation if, for cumulative (future) conditions, the Project's volume is equal to, or greater than five percent of the difference between cumulative (future) and existing volumes. The growth factor derived from the Napa-Sonoma Model was applied to existing volumes at SR 29/Hoffman Lane. The project contributes less than one-half of one percent of the difference between existing and future volumes, and therefore has a less-than-significant impact under the criteria applied.

Access Analysis

The project site will be accessed via a single driveway on Solano Avenue.

Left-Turn Lane Warrants

The need for a left-turn lane on Solano Avenue at the project driveway was evaluated based on criteria contained in the *Napa County Road and Street Standards*, 2011. Solano Avenue has an approximate ADT volume of 1,930 vehicles.

Using the County's criteria, for an average daily traffic volume of approximately 1,930 vehicles on Solano Avenue and the proposed daily new trips at the Solano Avenue driveway, a left-turn lane is not currently warranted on Solano Avenue at the driveway serving the project site.

Future projected traffic volumes were estimated using the growth factor of 1.36. The estimated future ADT on Solano Avenue near the project driveway is 2,625 vehicles per day. Under these projected future volumes, a left-turn lane would still not be warranted on Solano Avenue at the project driveway. A copy of the warrant graph indicating both existing and future conditions is enclosed.

While turn lanes are not needed to accommodate project-generated traffic, the conditions during a special event were also taken into account. AASHTO's *Geometric Design of Highways and Streets* indicates that the hourly traffic volume used in design should not be exceeded very often. To avoid facilities with excessive capacities, AASHTO recommends that designs be based on volumes during the 30th highest hour. Since the proposed project results in added trips due to 100-person special events only once per year, this scenario is not appropriate for evaluation purposes. Further, it is unlikely that events will begin during the peak hours evaluated, but rather, they are more likely to begin and end during off-peak hours.

Finding – A left-turn lane is not warranted at the project driveway.

Conclusions and Recommendations

- The proposed project would be expected to generate an average of 26 daily trips, including 10 trips during the weekday p.m. peak hour, 14 trips during the weekend midday peak hour, and 18 trips during a Crush Saturday peak hour.
- A total of 13 special events are proposed, with the largest special event having 100 attendees and occurring once per year. The remaining 11 events would have 30 to 75 attendees.
- Solano Avenue currently operates at LOS A under existing conditions. Solano Avenue is expected to continue operating at LOS A under cumulative and future conditions, as well as with project-added traffic.
- The project would have a less than significant impact on intersections along SR 29.
- A left-turn lane is not warranted at the project driveway.

Thank you for giving W-Trans the opportunity to provide these services. Please call if you have any questions.

Sincerely,

Lauren Davini, EIT
Assistant Traffic Engineer

Dalene J. Whitlock, PE, PTOE
Principal

DJW/lgd/NAX095.L1

Enclosures: Winery Trip Generation Form
Roadway Level of Service Calculations
Turn Lane Warrants

Winery Traffic Information / Trip Generation Sheet

Project Name: Sleeping Lady Vineyards Winery Project Scenario: Proposed

Traffic during a Typical Weekday

Number of FT employees: 2	x 3.05 one-way trips per employee	=	6	daily trips.
Number of PT employees: 2	x 1.90 one-way trips per employee	=	4	daily trips.
Average number of weekday visitors: 20	/ 2.6 visitors per vehicle x 2 one-way trips	=	15	daily trips.
Gallons of production: 30000	/ 1,000 x .009 truck trips daily[3] x 2 one-way trips	=	1	daily trips.
	Total	=	26	**daily trips.**
	Number of total weekday trips x .38	=	10	**PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays): 2	x 3.05 one-way trips per employee	=	6	daily trips.
Number of PT employees (on Saturdays): 2	x 1.90 one-way trips per employee	=	4	daily trips.
Average number of weekend visitors: 20	/ 2.8 visitors per vehicle x 2 one-way trips	=	14	daily trips.
	Total	=	24	**daily trips.**
	Number of total Saturday trips x .57	=	14	**PM peak trips.**

Traffic during a Crush Saturday

Number of FT employees (during crush): 2	x 3.05 one-way trips per employee	=	6	daily trips.
Number of PT employees (during crush): 4	x 1.90 one-way trips per employee	=	8	daily trips.
Average number of weekend visitors: 20	/ 2.8 visitors per vehicle x 2 one-way trips	=	14	daily trips.
Gallons of production: 30000	/ 1,000 x .009 truck trips daily x 2 one-way trips	=	1	daily trips.
Avg. annual tons of grape on-haul: 195	x .11 truck trips daily[4] x 2 one-way trips	=	3	daily trips.
	Total	=	31	**daily trips.**
	Number of total Saturday trips x .57	=	18	**PM peak trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): 5	x 2 one-way trips per staff person	=	10	trips.
Number of visitors (largest event): 100	/ 2.8 visitors per vehicle x 2 one-way trips	=	71	trips.
Number of special event truck trips (largest event): 4	x 2 one-way trips	=	8	trips.

[3] Assumes 1.47 materials & supplies trips + 0.8 case goods trips per 1,000 gallons of production / 250 days per year (see *Traffic Information Sheet Addendum* for reference).

[4] Assumes 4 tons per trip / 36 crush days per year (see *Traffic Information Sheet Addendum* for reference).

REVISED 06/08/2015

Note: as a member of the NVVA this applicant is entitled to an Action Napa Valley event under their Master Use Permit. This event has an allowed attendance of 100 persons, and while this applicant would almost certainly have a smaller number, estimated at 75 visitors, the larger attendance was conservatively used for analysis purposes.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Existing NB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 94 veh/h
Opposing direction volume, Vo 119 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	107	pc/h	136	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.5	mi/h
Average travel speed, ATSd	46.6	mi/h
Percent Free Flow Speed, PFFS	95.1	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	103	pc/h	130	pc/h
Base percent time-spent-following, (note-4) BPTSFd	11.9	%		
Adjustment for no-passing zones, fnp	16.1			
Percent time-spent-following, PTSFd	19.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.06	
Peak 15-min vehicle-miles of travel, VMT15	26	veh-mi
Peak-hour vehicle-miles of travel, VMT60	94	veh-mi
Peak 15-min total travel time, TT15	0.6	veh-h
Capacity from ATS, CdATS	1635	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1635	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.6	mi/h
Percent time-spent-following, PTSFd (from above)	19.0	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Existing SB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	119	veh/h
Opposing direction volume, Vo	94	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	136	pc/h	107	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.2	mi/h
Average travel speed, ATSd	46.9	mi/h
Percent Free Flow Speed, PFFS	95.6	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	130	pc/h	103	pc/h
Base percent time-spent-following, (note-4) BPTSFd	14.8	%		
Adjustment for no-passing zones, fnp	16.1			
Percent time-spent-following, PTSFd	23.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.08	
Peak 15-min vehicle-miles of travel, VMT15	32	veh-mi
Peak-hour vehicle-miles of travel, VMT60	119	veh-mi
Peak 15-min total travel time, TT15	0.7	veh-h
Capacity from ATS, CdATS	1627	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1627	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.9	mi/h
Percent time-spent-following, PTSFd (from above)	23.8	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Existing NB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 74 veh/h
Opposing direction volume, Vo veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	91	pc/h	158	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.7	mi/h
Average travel speed, ATSd	46.3	mi/h
Percent Free Flow Speed, PFFS	94.6	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	87	pc/h	151	pc/h
Base percent time-spent-following, (note-4) BPTSFd	10.2	%		
Adjustment for no-passing zones, fnp	16.0			
Percent time-spent-following, PTSFd	16.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.05	
Peak 15-min vehicle-miles of travel, VMT15	22	veh-mi
Peak-hour vehicle-miles of travel, VMT60	74	veh-mi
Peak 15-min total travel time, TT15	0.5	veh-h
Capacity from ATS, CdATS	1642	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1642	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.3	mi/h
Percent time-spent-following, PTSFd (from above)	16.0	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Existing SB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 106 veh/h
Opposing direction volume, Vo 74 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	131	pc/h	91	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.2	mi/h
Average travel speed, ATSd	47.1	mi/h
Percent Free Flow Speed, PFFS	96.1	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	125	pc/h	87	pc/h
Base percent time-spent-following, (note-4) BPTSFd	14.2	%		
Adjustment for no-passing zones, fnp	16.0			
Percent time-spent-following, PTSFd	23.6	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.08	
Peak 15-min vehicle-miles of travel, VMT15	31	veh-mi
Peak-hour vehicle-miles of travel, VMT60	106	veh-mi
Peak 15-min total travel time, TT15	0.7	veh-h
Capacity from ATS, CdATS	1627	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1627	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	47.1	mi/h
Percent time-spent-following, PTSFd (from above)	23.6	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Proj NB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 98 veh/h
Opposing direction volume, Vo 122 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	112	pc/h	139	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.6	mi/h
Average travel speed, ATSd	46.5	mi/h
Percent Free Flow Speed, PFFS	94.9	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	107	pc/h	133	pc/h
Base percent time-spent-following, (note-4) BPTSFd	12.4	%		
Adjustment for no-passing zones, fnp	16.3			
Percent time-spent-following, PTSFd	19.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.07	
Peak 15-min vehicle-miles of travel, VMT15	27	veh-mi
Peak-hour vehicle-miles of travel, VMT60	98	veh-mi
Peak 15-min total travel time, TT15	0.6	veh-h
Capacity from ATS, CdATS	1635	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1635	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.5	mi/h
Percent time-spent-following, PTSFd (from above)	19.7	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Proj SB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	122	veh/h
Opposing direction volume, Vo	98	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	139	pc/h	112	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.3	mi/h
Average travel speed, ATSd	46.8	mi/h
Percent Free Flow Speed, PFFS	95.4	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	133	pc/h	107	pc/h

Base percent time-spent-following, (note-4) BPTSFd	15.1	%
Adjustment for no-passing zones, fnp	16.3	
Percent time-spent-following, PTSFd	24.1	%

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.08	
Peak 15-min vehicle-miles of travel, VMT15	33	veh-mi
Peak-hour vehicle-miles of travel, VMT60	122	veh-mi
Peak 15-min total travel time, TT15	0.7	veh-h
Capacity from ATS, CdATS	1627	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1627	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.8	mi/h
Percent time-spent-following, PTSFd (from above)	24.1	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Proj NB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	78	veh/h
Opposing direction volume, Vo	111	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	96	pc/h	137	pc/h

Free-Flow Speed from Field Measurement:			
Field measured speed, (note-3) S FM		-	mi/h
Observed total demand, (note-3) V		-	veh/h
Estimated Free-Flow Speed:			
Base free-flow speed, (note-3) BFFS		50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS		0.0	mi/h
Adj. for access point density, (note-3) fA		1.0	mi/h
Free-flow speed, FFSd		49.0	mi/h
Adjustment for no-passing zones, fnp		0.5	mi/h
Average travel speed, ATSd		46.7	mi/h
Percent Free Flow Speed, PFFS		95.2	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	92	pc/h	131	pc/h
Base percent time-spent-following, (note-4) BPTSFd	10.8	%		
Adjustment for no-passing zones, fnp	16.2			
Percent time-spent-following, PTSFd	17.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.06	
Peak 15-min vehicle-miles of travel, VMT15	23	veh-mi
Peak-hour vehicle-miles of travel, VMT60	78	veh-mi
Peak 15-min total travel time, TT15	0.5	veh-h
Capacity from ATS, CdATS	1635	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1635	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.7	mi/h
Percent time-spent-following, PTSFd (from above)	17.5	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Proj SB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	111	veh/h
Opposing direction volume, Vo	78	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	137	pc/h	96	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.2	mi/h
Average travel speed, ATSd	47.0	mi/h
Percent Free Flow Speed, PFFS	95.9	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	131	pc/h	92	pc/h
Base percent time-spent-following, (note-4) BPTSFd	14.9	%		
Adjustment for no-passing zones, fnp	16.2			
Percent time-spent-following, PTSFd	24.4	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.08	
Peak 15-min vehicle-miles of travel, VMT15	33	veh-mi
Peak-hour vehicle-miles of travel, VMT60	111	veh-mi
Peak 15-min total travel time, TT15	0.7	veh-h
Capacity from ATS, CdATS	1627	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1627	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	47.0	mi/h
Percent time-spent-following, PTSFd (from above)	24.4	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Appr NB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 111 veh/h
Opposing direction volume, Vo 129 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	127	pc/h	147	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.6	mi/h
Average travel speed, ATSd	46.2	mi/h
Percent Free Flow Speed, PFFS	94.4	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	121	pc/h	141	pc/h

Base percent time-spent-following, (note-4) BPTSFd	13.8	%
Adjustment for no-passing zones, fnp	16.8	
Percent time-spent-following, PTSFd	21.6	%

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.07	
Peak 15-min vehicle-miles of travel, VMT15	30	veh-mi
Peak-hour vehicle-miles of travel, VMT60	111	veh-mi
Peak 15-min total travel time, TT15	0.6	veh-h
Capacity from ATS, CdATS	1642	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1642	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.2	mi/h
Percent time-spent-following, PTSFd (from above)	21.6	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Appr SB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	129	veh/h
Opposing direction volume, Vo	111	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	147	pc/h	127	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.4	mi/h
Average travel speed, ATSd	46.4	mi/h
Percent Free Flow Speed, PFFS	94.8	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	141	pc/h	121	pc/h
Base percent time-spent-following, (note-4) BPTSFd	15.9	%		
Adjustment for no-passing zones, fnp	16.8			
Percent time-spent-following, PTSFd	24.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.09	
Peak 15-min vehicle-miles of travel, VMT15	35	veh-mi
Peak-hour vehicle-miles of travel, VMT60	129	veh-mi
Peak 15-min total travel time, TT15	0.8	veh-h
Capacity from ATS, CdATS	1635	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1635	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.4	mi/h
Percent time-spent-following, PTSFd (from above)	24.9	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Appr NB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	92	veh/h
Opposing direction volume, Vo	123	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	114	pc/h	152	pc/h

Free-Flow Speed from Field Measurement:			
Field measured speed, (note-3) S FM	-	mi/h	
Observed total demand, (note-3) V	-	veh/h	
Estimated Free-Flow Speed:			
Base free-flow speed, (note-3) BFFS	50.0	mi/h	
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h	
Adj. for access point density, (note-3) fA	1.0	mi/h	
Free-flow speed, FFSd	49.0	mi/h	
Adjustment for no-passing zones, fnp	0.7	mi/h	
Average travel speed, ATSd	46.3	mi/h	
Percent Free Flow Speed, PFFS	94.4	%	

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	109	pc/h	145	pc/h
Base percent time-spent-following, (note-4) BPTSFd	12.6	%		
Adjustment for no-passing zones, fnp	16.8			
Percent time-spent-following, PTSFd	19.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.07	
Peak 15-min vehicle-miles of travel, VMT15	27	veh-mi
Peak-hour vehicle-miles of travel, VMT60	92	veh-mi
Peak 15-min total travel time, TT15	0.6	veh-h
Capacity from ATS, CdATS	1642	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1642	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.3	mi/h
Percent time-spent-following, PTSFd (from above)	19.8	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Appr SB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	123	veh/h
Opposing direction volume, Vo	92	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	152	pc/h	114	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.3	mi/h
Average travel speed, ATSd	46.6	mi/h
Percent Free Flow Speed, PFFS	95.1	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	145	pc/h	109	pc/h
Base percent time-spent-following, (note-4) BPTSFd	16.3	%		
Adjustment for no-passing zones, fnp	16.8			
Percent time-spent-following, PTSFd	25.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.09	
Peak 15-min vehicle-miles of travel, VMT15	36	veh-mi
Peak-hour vehicle-miles of travel, VMT60	123	veh-mi
Peak 15-min total travel time, TT15	0.8	veh-h
Capacity from ATS, CdATS	1627	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1627	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.6	mi/h
Percent time-spent-following, PTSFd (from above)	25.9	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Appr Plus Proj NB

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 115 veh/h
Opposing direction volume, Vo 132 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	131	pc/h	151	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.7	mi/h
Average travel speed, ATSd	46.1	mi/h
Percent Free Flow Speed, PFFS	94.2	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	126	pc/h	144	pc/h
Base percent time-spent-following, (note-4) BPTSFd	14.3	%		
Adjustment for no-passing zones, fnp	17.1			
Percent time-spent-following, PTSFd	22.3	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.08	
Peak 15-min vehicle-miles of travel, VMT15	31	veh-mi
Peak-hour vehicle-miles of travel, VMT60	115	veh-mi
Peak 15-min total travel time, TT15	0.7	veh-h
Capacity from ATS, CdATS	1642	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1642	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.1	mi/h
Percent time-spent-following, PTSFd (from above)	22.3	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Appr Plus Proj SB

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	132	veh/h
Opposing direction volume, Vo	115	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	151	pc/h	131	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.5	mi/h
Average travel speed, ATSd	46.3	mi/h
Percent Free Flow Speed, PFFS	94.6	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	144	pc/h	126	pc/h

Base percent time-spent-following, (note-4) BPTSFd	16.2	%
Adjustment for no-passing zones, fnp	17.1	
Percent time-spent-following, PTSFd	25.3	%

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.09	
Peak 15-min vehicle-miles of travel, VMT15	36	veh-mi
Peak-hour vehicle-miles of travel, VMT60	132	veh-mi
Peak 15-min total travel time, TT15	0.8	veh-h
Capacity from ATS, CdATS	1635	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1635	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.3	mi/h
Percent time-spent-following, PTSFd (from above)	25.3	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Appr Plus Proj NB

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 96 veh/h
Opposing direction volume, Vo 128 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	119	pc/h	158	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.7	mi/h
Average travel speed, ATSd	46.1	mi/h
Percent Free Flow Speed, PFFS	94.1	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	114	pc/h	151	pc/h

Base percent time-spent-following, (note-4) BPTSFd	13.1	%
Adjustment for no-passing zones, fnp	17.1	
Percent time-spent-following, PTSFd	20.5	%

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.07	
Peak 15-min vehicle-miles of travel, VMT15	28	veh-mi
Peak-hour vehicle-miles of travel, VMT60	96	veh-mi
Peak 15-min total travel time, TT15	0.6	veh-h
Capacity from ATS, CdATS	1642	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1642	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.1	mi/h
Percent time-spent-following, PTSFd (from above)	20.5	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Exist Plus Appr Plus Proj SB

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	128	veh/h
Opposing direction volume, Vo	96	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	158	pc/h	119	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.4	mi/h
Average travel speed, ATSd	46.5	mi/h
Percent Free Flow Speed, PFFS	94.9	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	151	pc/h	114	pc/h
Base percent time-spent-following, (note-4) BPTSFd	16.9	%		
Adjustment for no-passing zones, fnp	17.1			
Percent time-spent-following, PTSFd	26.6	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.09	
Peak 15-min vehicle-miles of travel, VMT15	38	veh-mi
Peak-hour vehicle-miles of travel, VMT60	128	veh-mi
Peak 15-min total travel time, TT15	0.8	veh-h
Capacity from ATS, CdATS	1635	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1635	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.5	mi/h
Percent time-spent-following, PTSFd (from above)	26.6	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Future NB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 128 veh/h
Opposing direction volume, Vo 162 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	146	pc/h	185	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h
Average travel speed, ATSd	45.4	mi/h
Percent Free Flow Speed, PFFS	92.7	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	140	pc/h	177	pc/h
Base percent time-spent-following, (note-4) BPTSFd	15.8	%		
Adjustment for no-passing zones, fnp	18.6			
Percent time-spent-following, PTSFd	24.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.09	
Peak 15-min vehicle-miles of travel, VMT15	35	veh-mi
Peak-hour vehicle-miles of travel, VMT60	128	veh-mi
Peak 15-min total travel time, TT15	0.8	veh-h
Capacity from ATS, CdATS	1651	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1651	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	45.4	mi/h
Percent time-spent-following, PTSFd (from above)	24.0	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Future SB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 162 veh/h
Opposing direction volume, Vo 128 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	185	pc/h	146	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S_FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.6	mi/h
Average travel speed, ATSd	45.8	mi/h
Percent Free Flow Speed, PFFS	93.5	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	177	pc/h	140	pc/h
Base percent time-spent-following, (note-4) BPTSFd	19.4	%		
Adjustment for no-passing zones, fnp	18.6			
Percent time-spent-following, PTSFd	29.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.11	
Peak 15-min vehicle-miles of travel, VMT15	44	veh-mi
Peak-hour vehicle-miles of travel, VMT60	162	veh-mi
Peak 15-min total travel time, TT15	1.0	veh-h
Capacity from ATS, CdATS	1642	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1642	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	45.8	mi/h
Percent time-spent-following, PTSFd (from above)	29.8	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Future NB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 101 veh/h
Opposing direction volume, Vo 145 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	125	pc/h	179	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h
Average travel speed, ATSd	45.7	mi/h
Percent Free Flow Speed, PFFS	93.3	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	119	pc/h	171	pc/h
Base percent time-spent-following, (note-4) BPTSFd	13.6	%		
Adjustment for no-passing zones, fnp	17.7			
Percent time-spent-following, PTSFd	20.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.07	
Peak 15-min vehicle-miles of travel, VMT15	30	veh-mi
Peak-hour vehicle-miles of travel, VMT60	101	veh-mi
Peak 15-min total travel time, TT15	0.7	veh-h
Capacity from ATS, CdATS	1651	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1651	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	45.7	mi/h
Percent time-spent-following, PTSFd (from above)	20.9	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Future SB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	145	veh/h
Opposing direction volume, Vo	101	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	179	pc/h	125	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.4	mi/h
Average travel speed, ATSd	46.2	mi/h
Percent Free Flow Speed, PFFS	94.3	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	171	pc/h	119	pc/h
Base percent time-spent-following, (note-4) BPTSFd	18.8	%		
Adjustment for no-passing zones, fnp	17.7			
Percent time-spent-following, PTSFd	29.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.11	
Peak 15-min vehicle-miles of travel, VMT15	43	veh-mi
Peak-hour vehicle-miles of travel, VMT60	145	veh-mi
Peak 15-min total travel time, TT15	0.9	veh-h
Capacity from ATS, CdATS	1635	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1635	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.2	mi/h
Percent time-spent-following, PTSFd (from above)	29.2	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Future Plus Proj NB

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	132	veh/h
Opposing direction volume, Vo	165	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	151	pc/h	188	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h
Average travel speed, ATSd	45.3	mi/h
Percent Free Flow Speed, PFFS	92.5	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	144	pc/h	180	pc/h

Base percent time-spent-following, (note-4) BPTSFd	16.2	%
Adjustment for no-passing zones, fnp	18.8	
Percent time-spent-following, PTSFd	24.6	%

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.09	
Peak 15-min vehicle-miles of travel, VMT15	36	veh-mi
Peak-hour vehicle-miles of travel, VMT60	132	veh-mi
Peak 15-min total travel time, TT15	0.8	veh-h
Capacity from ATS, CdATS	1651	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1651	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	45.3	mi/h
Percent time-spent-following, PTSFd (from above)	24.6	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekday PM Peak
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Future Plus Proj SB

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 165 veh/h
Opposing direction volume, Vo 132 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	188	pc/h	151	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.7	mi/h
Average travel speed, ATSd	45.7	mi/h
Percent Free Flow Speed, PFFS	93.3	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	180	pc/h	144	pc/h
Base percent time-spent-following, (note-4) BPTSFd	19.7	%		
Adjustment for no-passing zones, fnp	18.8			
Percent time-spent-following, PTSFd	30.1	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.11	
Peak 15-min vehicle-miles of travel, VMT15	45	veh-mi
Peak-hour vehicle-miles of travel, VMT60	165	veh-mi
Peak 15-min total travel time, TT15	1.0	veh-h
Capacity from ATS, CdATS	1642	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1642	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	45.7	mi/h
Percent time-spent-following, PTSFd (from above)	30.1	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Future Plus Proj NB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	105	veh/h
Opposing direction volume, Vo	150	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	130	pc/h	185	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h
Average travel speed, ATSd	45.6	mi/h
Percent Free Flow Speed, PFFS	93.0	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	124	pc/h	177	pc/h
Base percent time-spent-following, (note-4) BPTSFd	14.1	%		
Adjustment for no-passing zones, fnp	18.0			
Percent time-spent-following, PTSFd	21.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.08	
Peak 15-min vehicle-miles of travel, VMT15	31	veh-mi
Peak-hour vehicle-miles of travel, VMT60	105	veh-mi
Peak 15-min total travel time, TT15	0.7	veh-h
Capacity from ATS, CdATS	1651	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1651	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	45.6	mi/h
Percent time-spent-following, PTSFd (from above)	21.5	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	W-Trans
Agency/Co.	Napa County
Date Performed	7/18/16
Analysis Time Period	Weekend Midday
Highway	Solano Avenue
From/To	near 5537 Solano Avenue
Jurisdiction	County of Napa
Analysis Year	2016
Description	Future Plus Proj SB Conditions

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.85	
Shoulder width	7.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	5	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd	150	veh/h
Opposing direction volume, Vo	105	veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	2.0*		2.0*	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.952		0.952	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	185	pc/h	130	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	50.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.0	mi/h
Adjustment for no-passing zones, fnp	0.5	mi/h
Average travel speed, ATSd	46.1	mi/h
Percent Free Flow Speed, PFFS	94.1	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	177	pc/h	124	pc/h
Base percent time-spent-following, (note-4) BPTSFd	19.4	%		
Adjustment for no-passing zones, fnp	18.0			
Percent time-spent-following, PTSFd	30.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.11	
Peak 15-min vehicle-miles of travel, VMT15	44	veh-mi
Peak-hour vehicle-miles of travel, VMT60	150	veh-mi
Peak 15-min total travel time, TT15	1.0	veh-h
Capacity from ATS, CdATS	1635	veh/h
Capacity from PTSF, CdPTSF	1692	veh/h
Directional Capacity	1635	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.1	mi/h
Percent time-spent-following, PTSFd (from above)	30.0	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

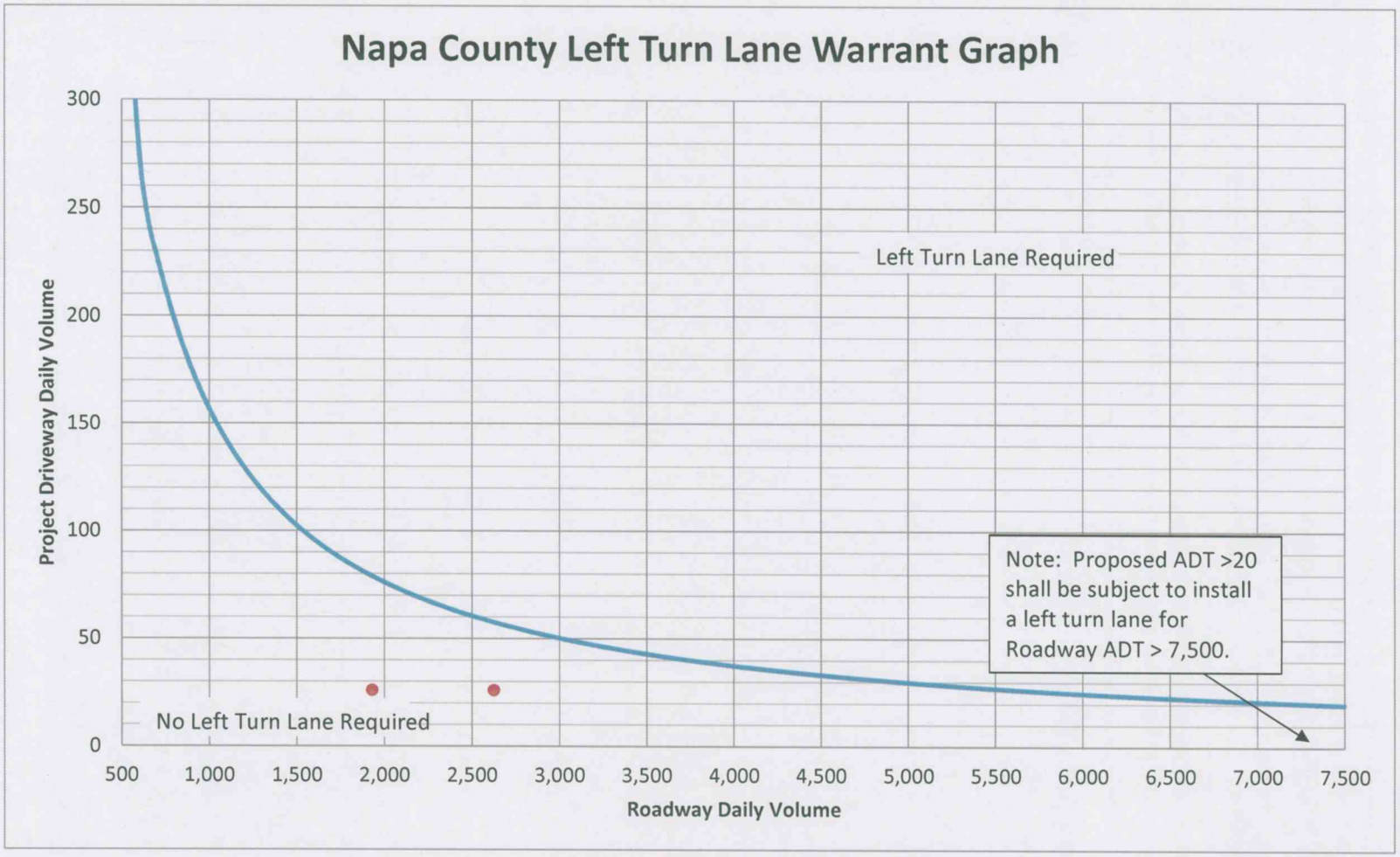
Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service


Napa County Left Turn Lane Warrant Graph
Project Driveway Daily Volume
300
250
200
150
100
50
0
Left Turn Lane Required
Note: Proposed ADT >20 shall be subject to install a left turn lane for Roadway ADT > 7,500.
No Left Turn Lane Required
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
Roadway Daily Volume