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Traffic Impact Study
Sullivan Rutherford Estate
P19-00156-MOD

Traffic Impact Study for the Sullivan Rutherford Estate Winery Project

Prepared for the County of Napa

Submitted by
W-Trans

June 29, 2020

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Executive Summary

The Sullivan Rutherford Estate Winery at 1090 Galleron Road in the County of Napa has proposed modifications to their Conditional Use Permit (CUP) to increase production from 22,500 gallons per year to 33,000 gallons annually, add twelve 25-person annual events, and increase the number of employees from 12 to 20 persons. With the change in the CUP the winery would be expected to generate an addition 45 trips daily on Fridays and 22 trips daily on weekends, including 11 trips added to the weekday p.m. peak hour and 7 additional trips during the weekend peak hour. The additional agriculture promotional events would be expected to generate a maximum of 312 trips annually.

The study area included the segment of State Route 29 providing access to the project site, as well as the intersection of SR 29/Galleron Road with operating conditions during the Friday and Saturday p.m. peak periods evaluated. Both the study intersection and study segment experienced below-average collision rates for the five-year period evaluated. Study scenarios included Existing, Near-Term (with traffic from seven nearby projects added), and Cumulative without and with project traffic added. The intersection of SR 29/Galleron Road is expected to operate acceptably at LOS A overall and LOS C on the stop-controlled side street approach under all scenarios evaluated. The study segment of SR 29 is currently operating at LOS E and is expected to continue operating at LOS E under all scenarios evaluated. The project would be expected to increase the percent time spent following, which is the metric used for two-lane highways, by 0.1-percent, which is considered an acceptable change.

The estimated VMT associated with the change in the CUP is 988 vehicle miles traveled. To reduce the project's VMT implementation of a Transportation Demand Management (TDM) program is recommended. This program could include measures such as encouraging guests to arrive in large groups, such as a van, and asking employees to carpool. Additionally, bike parking should be provided to encourage trips other than by motor vehicle.

Access to the site would be via Galleron Road, with a second driveway to be added as part of the modified CUP. Sight distance from the proposed driveway location is adequate and a left-turn lane would not be warranted at either driveway location based on application of Napa County criteria.

Introduction

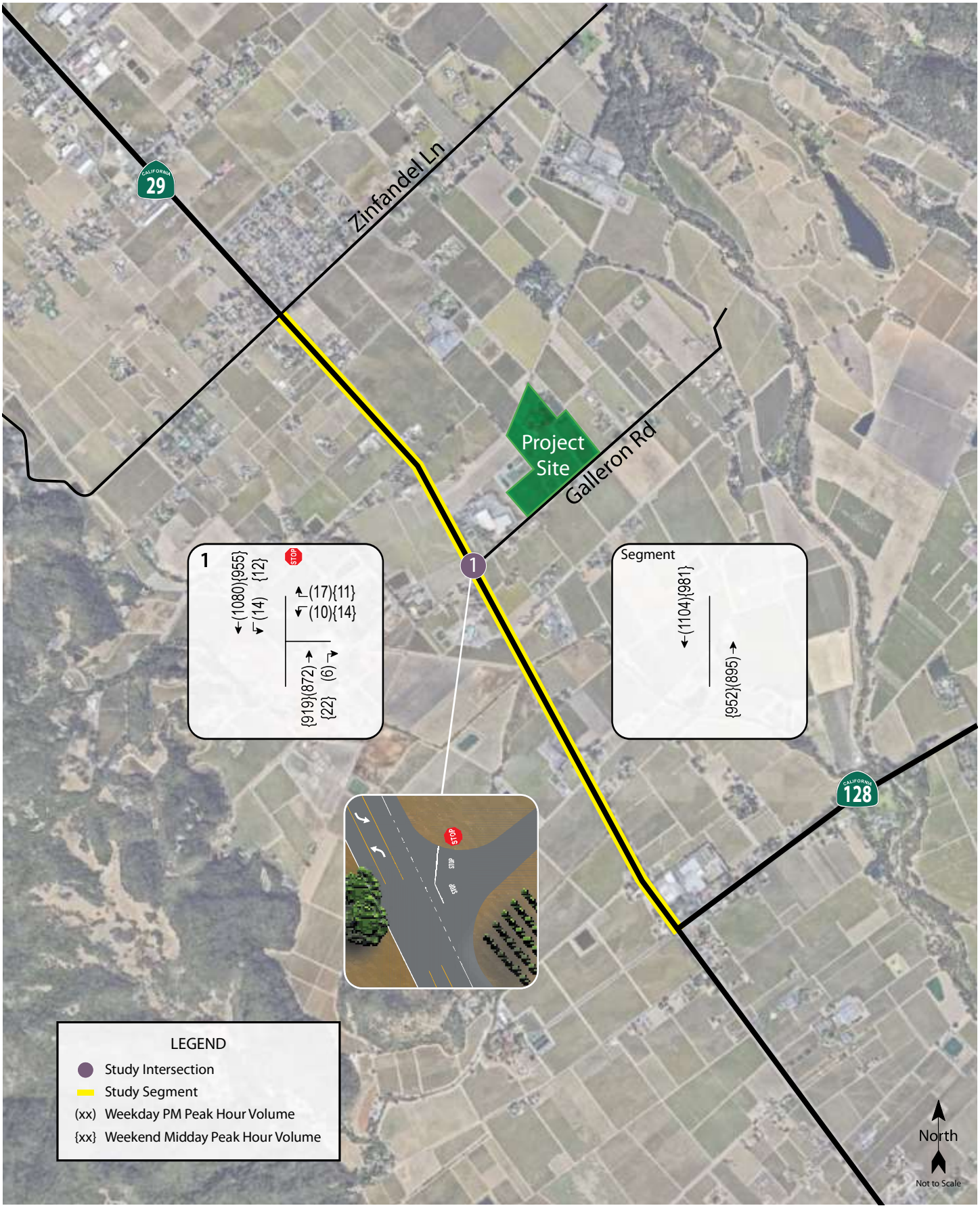
This report presents an analysis of the potential traffic impacts that would be associated with the proposed modifications to the Conditional Use Permit (CUP) for the Sullivan Rutherford Estate Winery located at 1090 Galleron Road in the County of Napa. The traffic study was completed in accordance with the criteria established by the County of Napa and is consistent with standard traffic engineering techniques.

Prelude

The purpose of a traffic impact study is to provide County staff and policy makers with data they can use to make an informed decision regarding the potential traffic impacts of a proposed project, and any associated improvements that would be required to mitigate these impacts to a level of insignificance as defined by the County's General Plan or other policies. Vehicular traffic impacts are typically evaluated by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on existing travel patterns or anticipated travel patterns specific to the proposed project, then analyzing the impact the new traffic would be expected to have on critical intersections or roadway segments. Impacts relative to access for pedestrians, bicyclists, and to transit are also addressed.

Project Profile

The proposed project includes increasing permitted production from 22,500 gallons per year to 33,000 gallons annually. In addition to the proposed increase in production, the project includes construction of a new 16,428 square foot winery building, adding twelve 25-person annual events, and increasing the number of employees from 12 to 20 persons. The project site is located at 1090 Galleron Road in the County of Napa, as shown in Figure 1.



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Traffic Impact Study for the Sullivan Rutherford Estate Winery Project

Figure 1 – Study Area, Lane Configuration and Existing Traffic Volumes

Transportation Setting

Operational Analysis

Study Area and Periods

The study area consists of the segment of State Route 29 providing access to the project site, as well as the intersection of SR 29/Galleron Road.

Operating conditions during the Friday and Saturday p.m. peak periods were evaluated as these time periods reflect the highest traffic volumes areawide and for the proposed project. The evening weekday peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion of the day during the homeward bound commute, while the weekend midday peak occurs between 1:45 p.m. to 3:45 p.m.

Study Intersection

SR 29/Galleron Road is a tee-intersection with westbound Galleron Road approach stop-controlled.

Study Roadway

SR 29 has a posted speed limit of 50 miles per hour (mph) in the vicinity of the project site. SR 29 runs north-south and has two 12-foot travel lanes separated by a two-way left-turn lane in the study area.

The locations of the study intersection and roadway together with the existing lane configurations and controls are shown in Figure 1.

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available at the time data was evaluated was October 1, 2014 through November 30, 2019.

The calculated collision rates for the study intersection and roadway were compared to average collision rates for similar facilities statewide, as indicated in *2016 Collision Data on California State Highways*, California Department of Transportation (Caltrans). Based on collisions within the five-year study period, the study intersection experienced a collision rate of 0.14 collisions per million vehicles entering (c/mve), which is a lower rate than the statewide average for similar facilities of 0.16 c/mve. Similarly, the segment of SR 29 between Zinfandel Lane and SR 128 has a below-average collision rate of 0.75 collisions per million vehicle miles (c/mvm) compared to the statewide average for similar facilities of 0.81 c/mvm. The collision rate calculations for both the study intersection and study roadway are provided in Appendix A.

Alternative Modes

Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. There are no pedestrian facilities in the vicinity of the project site or at SR 29/Galleron Road, which is consistent with the character of the rural location.

Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2017, classifies bikeways into four categories:

- **Class I Multi-Use Path** – a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- **Class II Bike Lane** – a striped and signed lane for one-way bike travel on a street or highway.
- **Class III Bike Route** – signing only for shared use with motor vehicles within the same travel lane on a street or highway.
- **Class IV Bikeway** – also known as a separated bikeway, a Class IV Bikeway is for the exclusive use of bicycles and includes a separation between the bikeway and the motor vehicle traffic lane. The separation may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking.

In the project area, Class II bike lanes exist on SR 29 between SR 128 and Madison Street. Bicyclists ride in the roadway along all other streets within the project study area. Table 1 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the *Napa Countywide Bicycle Plan,* Napa Valley Transportation Authority, 2019.

Table 1 – Bicycle Facility Summary

Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
SR 29	II	4.80	SR 128	Madison St
Planned				
Vine Trail	I	15.60	Dunaweal Ln	Madison St

Source: *Napa Countywide Bicycle Plan,* Napa Valley Transportation Authority, 2019

Transit Facilities

There are no transit routes that stop within one-quarter mile, which is considered a comfortable walking distance, of the project site. The closest transit stop is approximately one mile from the project site, just south of the intersection of SR 29/Zinfandel Lane. While the bus stop is not within walking distance to the project site, employees could reasonably bike between the site and the bus stop. The bus stop provides service to the VINE Transit Route 10, which runs between the Napa Valley College and Calistoga.

Capacity Analysis

Intersection Level of Service Methodologies

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersection was analyzed using the "Two-Way Stop-Controlled" methodology published in the *Highway Capacity Manual* (HCM), 6th Edition, Transportation Research Board, 2018. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle. The "Two-Way Stop-Controlled" intersection capacity methodology determines a level of service for each minor turning movement by estimating the level of average delay in seconds per vehicle. Results are presented for individual movements together with the weighted overall average delay for the intersection.

The ranges of delay associated with the various levels of service are indicated in Table 2.

Table 2 – Two-Way Stop-Controlled Intersection Level of Service Criteria	
LOS A	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.
LOS B	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.
LOS C	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.
LOS D	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.
LOS E	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side street.
LOS F	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.

Reference: *Highway Capacity Manual*, 6th Edition, Transportation Research Board, 2018

Two-Lane Highway 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." 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. The measure of effectiveness by which Level of Service is determined on Class II highways is percent time spent following (PTSF), or the proportion of time that drivers on the highway are limited in their speed by

a driver in front of them. SR 29 was defined as a Class II roadway for the purposes of this analysis. A summary of the PTSF breakpoints is shown in Table 3.

Table 3 – Automobile Level of Service Criteria

LOS	Class II Highways PTSF (%)
A	≤40
B	>40-55
C	>55-70
D	>70-85
E	≤85

Notes: LOS = Level of Service; PTSF = Percent Time Spent Following
Reference: *Highway Capacity Manual*, Transportation Research Board, 2010

Traffic Operation Standards

Napa County

In the Circulation Element of the *Napa County General Plan*, the following policies have been adopted:

- **Policy CIR-31** – The County seeks to provide a roadway system that maintains current roadway capacities in most locations and is efficient in providing local access.

- **Policy CIR-38** – The County seeks to maintain operations of roads and intersections in the unincorporated County area that minimize travel delays and promote safe access for all users. Operational analysis shall be conducted according to the latest version of the Highway Capacity Manual and as described in the current version of the County's Transportation Impact Study Guidelines. In general, the County seeks to maintain Level of Service (LOS) D on arterial roadways and at signalized intersections, as the service level that best aligns with the County's desire to balance its rural character with the needs of supporting economic vitality and growth.

  In situations where the County determines that achieving LOS D would cause an unacceptable conflict with other goals and objectives, minimizing collisions and the adequacy of local access will be the County's priorities. Mitigating operational impacts should first focus on reducing the project's vehicular trips through modifying the project definition, applying TDM strategies, and/or applying new technologies that could reduce vehicular travel and associated delays; then secondarily should consider physical infrastructure changes. Proposed mitigations will be evaluated for their effect on collisions and local access, and for their effectiveness in achieving the maximum potential reduction in the project's operational impacts (see the County's Transportation Impact Study Guidelines for a list of potential mitigation measures).

  The following roadway segments are exceptions to the LOS D standard described above:
  - *State Route 29 in the unincorporated areas between Yountville and Calistoga: LOS F is acceptable.*
  - *Silverado Trail between State Route 128 and Yountville Cross Road: LOS E is acceptable.*

- *State Route 12/121 between the Napa/Sonoma county line and Carneros Junction: LOS F is acceptable.*
- *American Canyon Road from I-80 to American Canyon City Limit: LOS E is acceptable.*

To provide a more quantitative method of adhering to the above standards, the County refers to G*uidelines for Interpretation of General Plan Circulation Policies on Significance Criteria* (Fehr & Peers, 2015). 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:

- A signalized intersection operates at LOS A, B, C, or D during the selected peak hours without Project trips, and the LOS deteriorates to LOS E or F with the addition of Project trips; or

- A signalized intersection operates at LOS E or F during the selected peak hours without Project trips, and the addition of Project trips increases the total entering volume by one percent or more.

  - *Project Contribution % = Project Trips ÷ Existing Volumes*

- An unsignalized intersection operates at LOS A, B, C, or D during the selected peak hours without Project trips, and the LOS deteriorates to LOS E or F with the addition of Project traffic; the peak hour traffic signal warrant criteria should also be evaluated and presented for informational purposes; or

- An unsignalized intersection operates at LOS E or F during the selected peak hours without Project trips, and the project contributes one percent or more of the total entering traffic for all-way stop-controlled intersections, or ten percent or more of the traffic on a side-street approach for side-street stop-controlled intersections; the peak hour traffic signal criteria should also be evaluated and presented for informational purposes. Both of those volumes are for the stop-controlled approaches only. Each stop-controlled approach that operates at LOS E or F should be analyzed individually

  - *<u>All-Way Stop-Controlled Intersections</u> – The following equation should be used if the all-way stop-controlled intersection operates at LOS E or F without the Project:*
    - *Project Contribution % = Project Trips ÷ Existing Volumes*
  - *<u>Side-Street Stop-Controlled Intersections</u> – The following equation should be used if the side-street stop-controlled intersection operates at LOS E or F without the Project:*
    - *Project Contribution % = Project Trips ÷ Existing Volumes*

- An arterial segment operates at LOS A, B, C or D during the selected peak hours without Project trips, and deteriorates to LOS E or F with the addition of Project trips; or

- An arterial segment operates at LOS E or F during the selected peak hours without Project trips, and the addition of Project trips increases the total segment volume by one percent or more. The following equation should be used if the arterial segment operates at LOS E or F without the Project:

  - *Project Contribution % = Project Trips ÷ Existing Volumes*

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.

- Cumulative Conditions – A Project's contribution to a cumulative condition would be calculated as the Project's percentage contribution to the total growth in traffic. This calculation applies to arterials, signalized intersections, and unsignalized intersections.

    - *Project Contribution % = Project Trips ÷ (Cumulative Volumes – Existing Volumes)*

Significance threshold for failing intersections: General Plan policy accepts LOS E and F in certain instances. If an unsignalized intersection is operating acceptably (LOS A through LOS D), and the project would cause the intersection to fall to LOS E or LOS F, the applicant must mitigate the impact to restore to LOS D at minimum, or the project is considered to adversely affect operation of the intersection. If an intersection is already LOS E or LOS F, and the project would increase delay by five or more seconds, the applicant must mitigate the impact to lower the increase in delay, or else the project would be considered to adversely affect the intersection. The same standards apply to the analysis of minor approaches to unsignalized intersections. As CEQA Guidelines have shifted away from LOS and toward VMT as the determining factor in identifying significant transportation impacts, adverse effects to intersections may still be the basis for conditioning transportation improvements to improve or maintain existing LOS or denying a project for the project's potentially negative effects on public safety.

Caltrans

Caltrans indicates that they endeavor to maintain operation at the transition from LOS C to LOS D. Based on previous discussions with Caltrans staff, it is understood that the standard is to be applied to the overall average intersection delay, *not* that associated with any single movement or approach. Under this approach, if one movement experiences very high delay and also has moderate to high traffic volumes, the overall delay and level of service should reflect the critical nature of the condition. However, if one movement is expected to experience high delay, but has very low traffic volumes, the overall intersection operation will likely still meet Caltrans standards.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the weekday and weekend p.m. peak periods. This condition does not include project-generated traffic volumes. Volume data was collected in October 2019 while local schools were in session and harvest was underway.

Intersection Levels of Service

Under existing conditions, the study intersection is operating acceptably at LOS A overall and at LOS C at the stop-controlled approach during both studied peak period. The existing traffic volumes are shown in Figure 1. A summary of the intersection level of service calculations is contained in Table 4, and copies of the Level of Service calculations are provided in Appendix B.

Table 4 – Existing Peak Hour Intersection Levels of Service				
Study Intersection *Approach*	**Weekday PM Peak**		**Weekend PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. SR 29/Galleron Rd	0.3	A	0.3	A
Westbound (Galleron Rd) Approach	*17.3*	*C*	*17.1*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Roadway Segment Levels of Service

Under existing conditions, SR 29 is operating at LOS E in both directions during both peak hours. Although LOS E is below the County's threshold of LOS D, LOS F is considered acceptable operation on the segment of SR 29 between Yountville and Calistoga, which encompasses the study segment. A summary of the roadway segment level of service calculations is shown in Table 5, and copies of the Level of Service calculations are provided in Appendix C.

Table 5 – Existing Peak Hour Roadway Segment Levels of Service				
Study Segment **Direction**	**Weekday PM Peak**		**Weekend PM Peak**	
	PTSF (%)	**LOS**	**PTSF (%)**	**LOS**
SR 29 between Zinfandel Ln and SR 128				
Northbound	86.2	E	87.6	E
Southbound	90.8	E	88.8	E

Notes: PTSF = Percent Time Spent Following; LOS = Level of Service

Near-Term Conditions

Volumes for Existing plus Approved Conditions, or the near-term scenario, were developed to include trips from other approved and pending projects that would add traffic to the segment of SR 29 within the vicinity of Sullivan Rutherford Estate Winery. As directed by County staff, the following projects were included in the Near-Term scenario:

- **Piazza Del Dotto Major Modification**: According to the *Traffic Impact Study for the Piazza Del Dotto Winery Use Permit Modification,* W-Trans, April 2020, approximately five vehicles would be added northbound on the study segment of SR 29 during the weekday peak hour with eight trips southbound. During the weekend peak hour, three trips would be added northbound and four trips southbound along this section of SR 29.

Analysis of the following near-term projects is based on available trip generation information from the County of Napa staff and the County's website. To be conservative, all near-term project volumes were added to the study segment of SR 29 with 50 percent traveling northbound and 50 percent southbound.

- **Staglin Winery Major Modification**
- **Wheeler Farms Partner, LLC Modification**
- **Ballentine Vineyards Major Modification**

- **Provenance Winery Major Modification**
- **Cakebread Cellars Major Modification**
- **Bommarito Winery Use Permit**

Since the Bommarito Winery project is also located on Galleron Road, anticipated traffic was assumed to make turning movements at the study intersection. The other six projects were routed as through traffic on SR 29. While some of the Near-Term projects are at a far enough distance where it is likely not all the traffic generated would pass through the study area, to be conservative all anticipated traffic was assumed to travel along the study roadway and through the intersection of SR 29/Galleron Road.

The traffic volumes added to SR 29 to reflect Near-Term Conditions are summarized in Table 6. The trip generation forms for the Near-Term projects are provided in Appendix D.

Table 6 – Near-Term Traffic Volumes

Study Segment	Weekday PM Peak		Weekend PM Peak	
	NB	SB	NB	SB
SR 29 between Zinfandel Ln and SR 128	188	188	213	211

Under Existing plus Near Term Conditions, the study intersection would continue operating at LOS A overall and LOS C on the stop-controlled approach during both studied peak hours, with minor increases in delay. These results are summarized in Table 7 and Near-Term volumes are shown in Figure 2.

Table 7 – Near-Term Peak Hour Intersection Levels of Service

Study Intersection *Approach*	Weekday PM Peak		Weekend PM Peak	
	Delay	LOS	Delay	LOS
1. SR 29/Galleron Rd	0.3	A	0.5	A
Westbound (Galleron Rd) Approach	*21.2*	*C*	*21.5*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Similarly, the study roadway segment would continue operating at LOS E, which is acceptable under the County's standards. These results are summarized in Table 8.

Table 8 – Near-Term Peak Hour Roadway Segment Levels of Service

Study Segment Direction	Weekday PM Peak		Weekend PM Peak	
	PTSF (%)	LOS	PTSF (%)	LOS
SR 29 between Zinfandel Ln and SR 128				
Northbound	90.2	E	91.8	E
Southbound	93.5	E	92.2	E

Notes: PTSF = Percent Time Spent Following; LOS = Level of Service

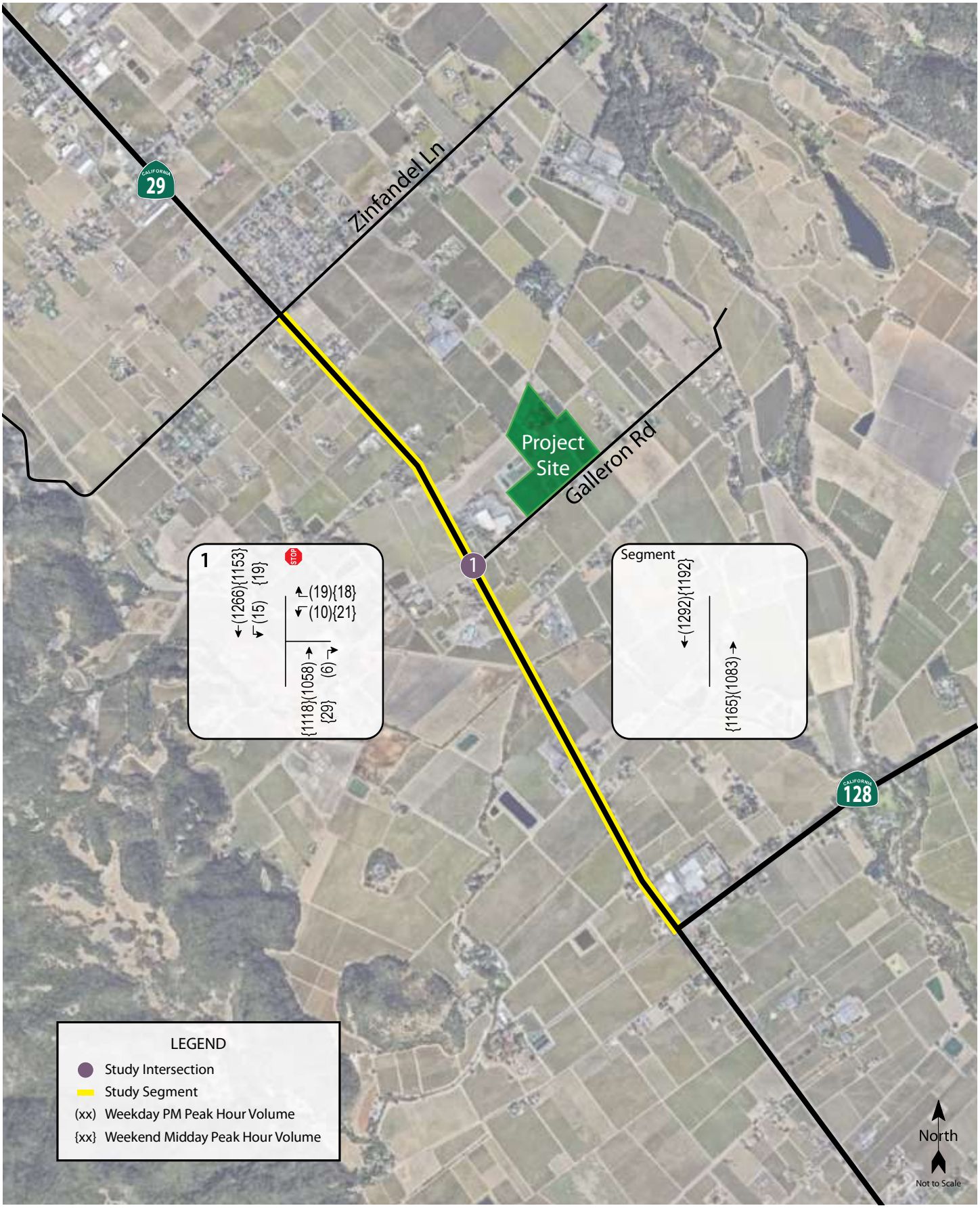

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Figure 2 – Near-Term Traffic Volumes

Cumulative Conditions

Future volumes for the horizon year 2040 were calculated based on output from the Napa Solano Travel Demand Model, maintained by the Solano Transportation Authority (STA). Base year (2015) and future (2040) segment volumes for the weekday p.m. peak period were used to calculate growth factors for the study intersection and roadway segment. The same growth factors used for the weekday p.m. peak hour were used for the weekend peak hour as the model does not contain information for weekend days.

Under the anticipated Cumulative volumes, the study intersections are expected to operate acceptably at LOS A overall and at LOS C at the stop-controlled approach during both peak hours. Operating conditions are summarized in Table 9 and Cumulative volumes are shown in Figure 3.

Table 9 – Cumulative Peak Hour Intersection Levels of Service

Study Intersection ***Approach***	Weekday PM Peak		Weekend PM Peak	
	Delay	**LOS**	**Delay**	**LOS**
1. SR 29/Galleron Rd	0.4	A	0.3	A
Westbound (Galleron Rd) Approach	*20.7*	*C*	*20.3*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Likewise, under projected cumulative volumes, the roadway study segment is expected to operate at LOS E in both directions, which is acceptable based on County standards. These results are summarized in Table 10.

Table 10 – Cumulative Peak Hour Roadway Segment Levels of Service

Study Segment Direction	Weekday PM Peak		Weekend PM Peak	
	PTSF (%)	**LOS**	**PTSF (%)**	**LOS**
SR 29 between Zinfandel Ln and SR 128				
Northbound	89.5	E	91.2	E
Southbound	93.4	E	91.7	E

Notes: PTSF = Percent Time Spent Following; LOS = Level of Service

It should be noted that due to the conservative approach applied for the Near-Term scenario wherein all trips associated with the other projects in the area were treated as new and added to the study segment, the Cumulative scenario has lower projected volumes than were used for the Near-Term scenario, and therefore better projected operation.

Project Description

The proposed project is a change in the existing winery's Condition Use Permit (CUP) to allow an increase in production from 22,500 gallons per year to 33,000 gallons annually. To increase production, the importation of grapes annually will be increased from 20 tons for the current production level to 58 tons with the proposed project. Additionally, construction of a new 16,428 square foot winery building is

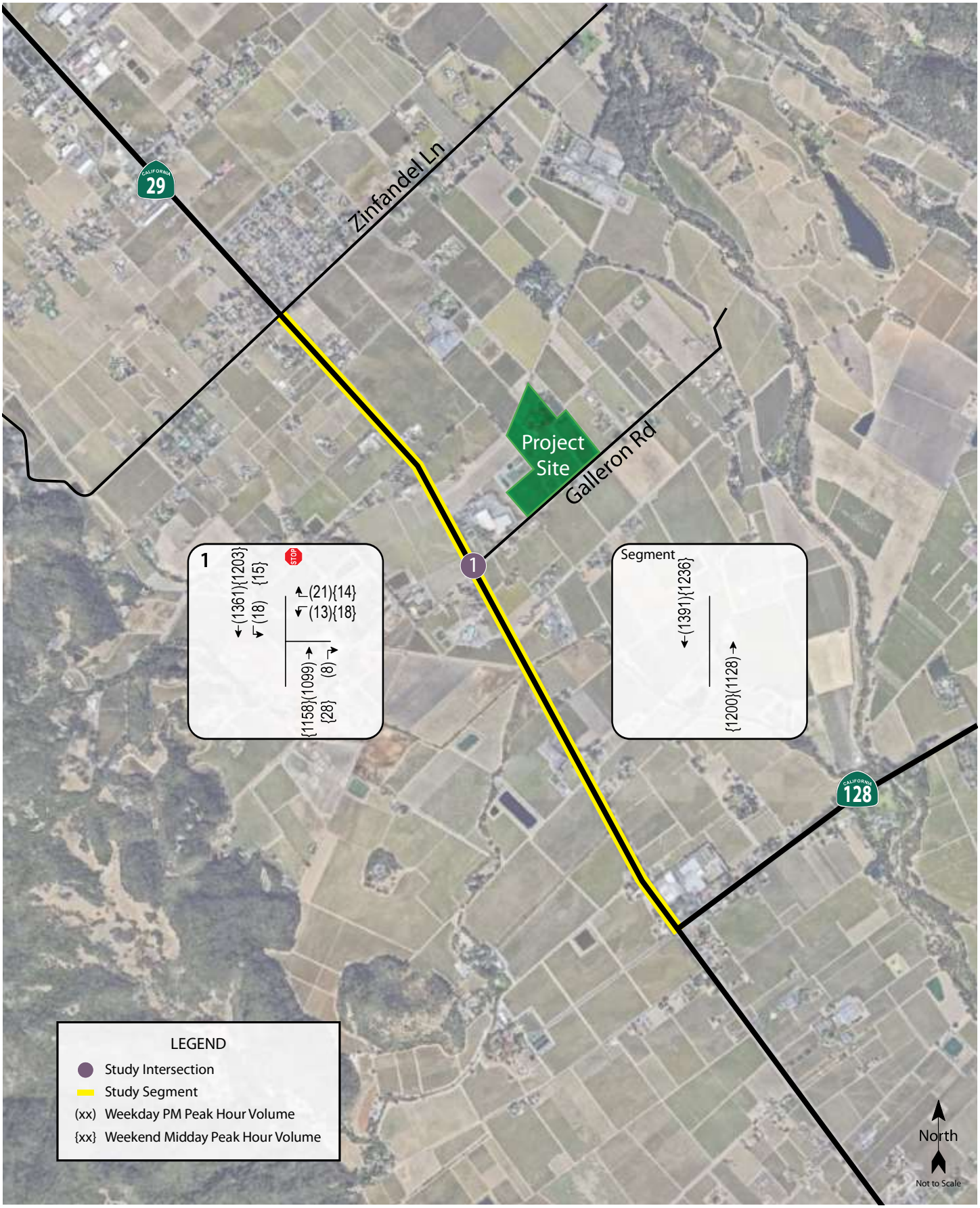

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Figure 3 – Future Traffic Volumes

proposed. The winery would operate between 8:00 a.m. and 5:00 p.m. for production. Currently, there are 12 full-time and one part-time employees on site for a typical Friday operation, with one additional part-time employee during harvest. With the proposed project, there would be an additional eight full-time employees and no part-time employees for a total of 20 employees during weekday typical operation and harvest season. For Saturday operation, there are three existing full-time employees during typical operation, and during harvest there are five full-time and two part-time employees. With the proposed project there would be four full-time employees during typical operation and seven full-time during harvest, with no part-time employees.

Visitation limits are proposed to be increased to 45 visitors a day, and a maximum of 300 per week between 10:00 a.m. and 6:00 p.m. every day. There are 20 existing parking spaces on-site, and with the proposed project eight would be added for a total of 28 parking spaces. Currently, the winery hosts six events a year with a maximum of 100 people per event. With the proposed project, these events would continue to occur, and twelve monthly 25-person events annually would be added.

The proposed project site plan is shown in Figure 4.

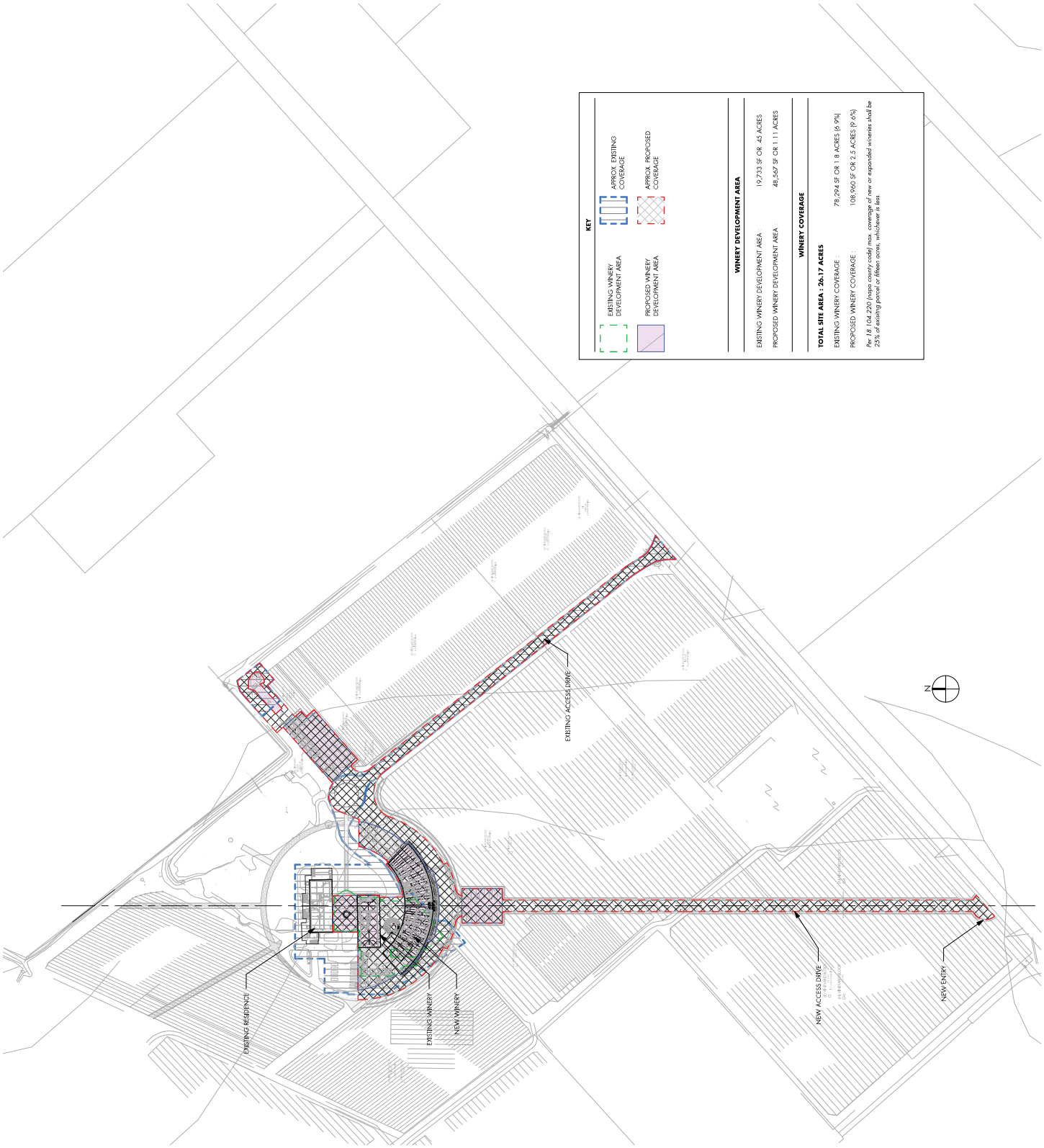
Trip Generation

The County of Napa's Winery Traffic Information/Trip Generation Sheet was used to determine the anticipated trip generation for the existing and proposed conditions. The form estimates the number of daily trips for weekdays and Saturdays based on the number of full- and part-time employees, maximum daily visitors, and production. It should be noted that the original permit did not specify requirements for some of the criteria, so "permitted" conditions were not evaluated.

To determine the ratio of peak hour trips to daily trips, counts were obtained on the winery driveway for a period of ten days, including two Fridays and two Saturdays. These counts from October 2019 (pre-evacuation for the Kincade Fire) indicate that the winery generates 18 percent of its daily trips during the Friday peak hour and 31 percent on Saturday. These ratios were applied to visitor trips to determine the anticipated trip generations. Copies of the counts as well as the worksheets for Existing and Proposed conditions are provided in Appendix E. It is noted that the winery is currently generating fewer trips daily or during peak hours than estimated using the County's form.

As the County of Napa's Winery Traffic Information/Trip Generation Sheet does not include guidance on inbound versus outbound trips during the peak hours, 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 midday peak-hour it was assumed that inbound and outbound trip ends would be evenly split. These assumptions are consistent with the count data obtained.

Based on application of these assumptions, with the proposed increase in production, staff and visitation, the winery would be expected to generate a total of 97 trips on a weekday during harvest and 55 on a Saturday during harvest, with 26 trips occurring during the weekday evening peak hour and 17 trips occurring during the weekend peak hour. As shown in Table 11, this would result in a net increase of 45 trips per weekday during harvest, including 11 trips during the weekday p.m. peak hour compared to the existing conditions. For weekend days, this would result in a net increase of 22 trips, including 7 trips during the weekend midday peak hour compared to the existing conditions.



Source: BCV Architects 9/19

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Figure 4 – Site Plan

Table 11 – Trip Generation Summary – Harvest Conditions								
Scenario	**Daily**		**Weekday PM Peak Hour**			**Weekend PM Peak Hour**		
	Weekday	**Weekend**	**Trips**	**In**	**Out**	**Trips**	**In**	**Out**
Existing	52	33	15	5	10	10	5	5
Proposed	97	55	26	9	17	17	8	9*
Net Change	**45**	**22**	**11**	**4**	**7**	**7**	**3**	**4**

Note: Trip generation as estimated above does not include special events; *round up for trips to add up to total

It should be noted that the newest update for the County of Napa's Winery Trip Generation form does not include events, so the trip generation for events was estimated based on the previous version of the County's Winery Trip Generation form. It was assumed that attendees would arrive at an occupancy of 2.6 persons per vehicle and each vehicle makes two trips (in and out of the site). Based on understanding of typical event operations, it was assumed that six employees would be needed for a 100-person event and 3 employees for a 25-person event in addition to the typical staffing. It is assumed that employees would each travel alone. As noted above, six events with a maximum of 100 visitors are currently permitted, and with the proposed project there would be an additional 12 events with 25 participants per year. An assumed 2.6 visitors per vehicle for a weekday event, 2.8 persons per vehicle for a weekend event and one employee per vehicle were applied to existing and proposed events to determine vehicle generate rate for maximum event attendance. Additionally, all six of the existing events were assumed to occur on weekends, while the twelve new events were assumed to occur on weekdays. Based on these assumptions, the existing events generate 504 trips annually, and the proposed increase in events would be expected to generate a maximum of 312 new trips per year. For both existing and proposed events the site would generate a maximum of 816 trips annually, as shown in Table 12.

Table 12 – Trip Generation Summary – Events								
Scenario	**Event Parameters**			**Vehicle Occupancy**		**Annual Vehicle Trips**		
	No./Year	**Guests**	**Employees**	**Guests**	**Employees**	**Guests**	**Employees**	**Total**
Existing	6	100	6	2.8	1.0	72	12	504
Proposed	12	25	3	2.6	1.0	20	6	312

Trip Distribution

The pattern used to allocate new project trips to the street network was determined based on familiarity with the area and surrounding region as well as likely origins and destinations for patrons of the project. Because Galleron Road terminates just east of the project driveway, all project-related trips were assumed to occur via SR 29. A distribution of 50 percent to the south and 50 percent to the north via SR 29 was used.

Intersection Operation

Existing plus Project Conditions

Upon the addition of project-related traffic to the Existing volumes, the study intersection is expected to operate acceptably at LOS A overall and LOS C on the side-street approach with or without project volumes added. These results are summarized in Table 13. Project traffic volumes are shown in Figure 5.

Table 13 – Existing and Existing plus Project Peak Hour Intersection Levels of Service

Study Intersection *Approach*	Existing Conditions				Existing plus Project			
	Weekday PM Peak		Weekend PM Peak		Weekday PM Peak		Weekend PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. SR 29/Galleron Rd	0.3	A	0.3	A	0.4	A	0.3	A
Westbound (Galleron Rd) Approach	*17.3*	*C*	*17.1*	*C*	*17.5*	*C*	*17.2*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Finding – The study intersection is expected to continue operating acceptably at the same levels of service upon the addition of project-generated traffic.

Near-Term plus Project Conditions

With project-related traffic added to Near-Term volumes, the study intersection is expected to continue operating acceptably, with minor increases in delay. These results are summarized in Table 14.

Table 14 – Near-Term and Near-Term plus Project Peak Hour Intersection Levels of Service

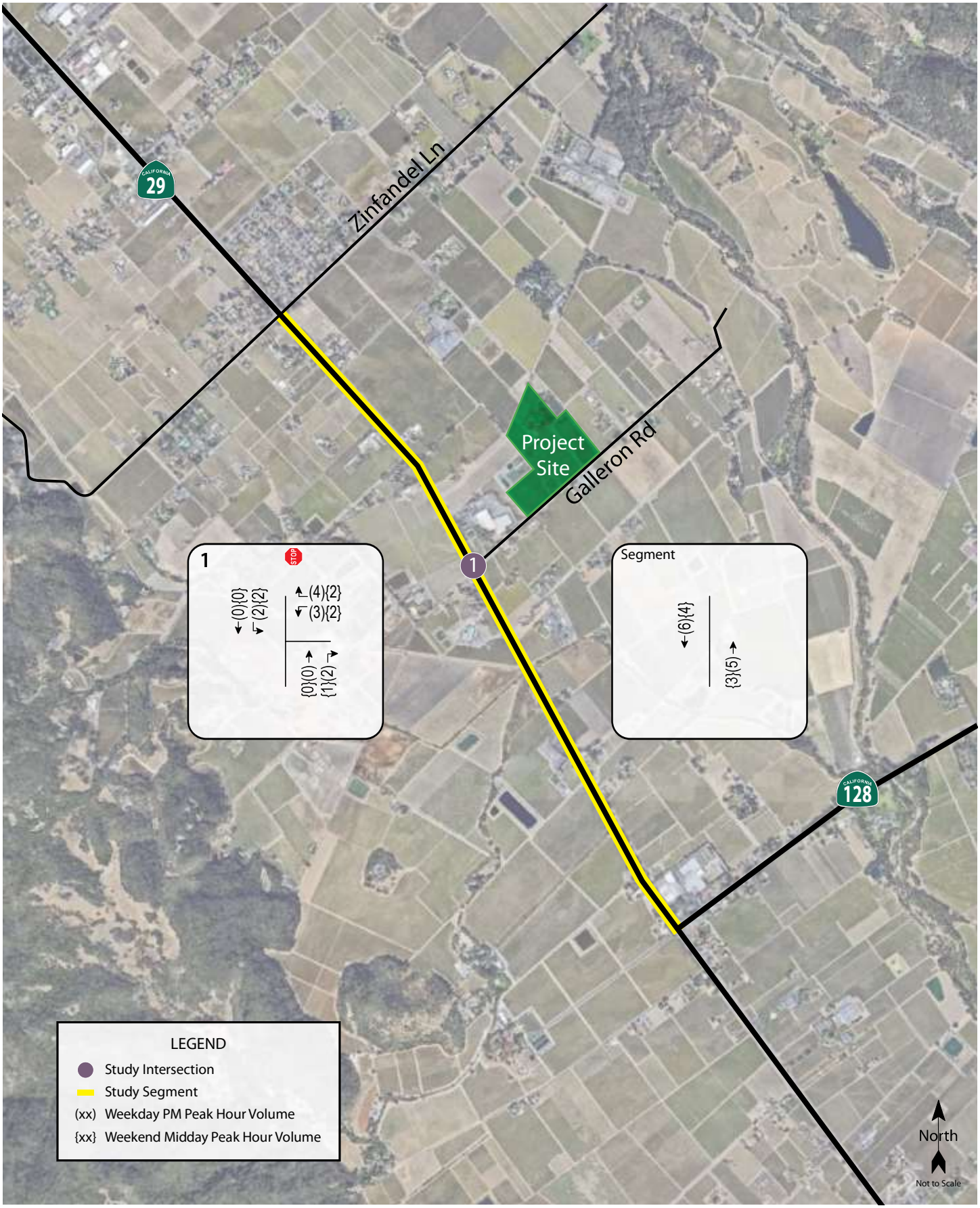
Study Intersection *Approach*	Near-Term Conditions				Near-Term plus Project			
	Weekday PM Peak		Weekend PM Peak		Weekday PM Peak		Weekend PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. SR 29/Galleron Rd	0.3	A	0.5	A	0.4	A	0.5	A
Westbound (Galleron Rd) Approach	*21.2*	*C*	*21.5*	*C*	*21.5*	*C*	*21.7*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Finding – The study intersection is expected to continue operating acceptably at the same levels of service upon the addition of project-generated traffic to near-term volumes.

Cumulative plus Project Conditions

Upon the addition of project-generated traffic to the anticipated Cumulative volumes, the study intersection is expected to operate acceptably at the same Levels of Service as without it. As noted above,



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Traffic Impact Study for the Sullivan Rutherford Estate Winery Project

Figure 5 – Project Traffic Volumes

volumes in the Near-Term scenario were conservatively applied, thus the Cumulative scenario appears to improve comparatively. The Cumulative plus Project operating conditions are summarized in Table 15.

Table 15 – Cumulative and Cumulative plus Project Peak Hour Intersection Levels of Service

Study Intersection *Approach*	Cumulative Conditions				Cumulative plus Project			
	Weekday PM Peak		Weekend PM Peak		Weekday PM Peak		Weekend PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. SR 29/Galleron Rd	0.4	A	0.3	A	0.4	A	0.4	A
Westbound (Galleron Rd) Approach	*20.7*	*C*	*20.3*	*C*	*20.9*	*C*	*20.4*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Finding – The study intersection will continue operating acceptably with project traffic added to future volumes, at the same Levels of Service as without it. As noted for Cumulative Conditions (without the Project), because of the conservative approach to developing the Near-Term volumes, that scenario is based on higher volumes than are projected for the Cumulative scenario.

Roadway Segment Operation

Existing plus Project Conditions

Under Existing plus Project volumes, the study roadway segment is expected to continue operating at LOS E with minor increases in the percent time spent following. These results are summarized in Table 16. Project traffic volumes are shown in Figure 5.

Table 16 – Existing and Existing plus Project Peak Hour Roadway Segment Levels of Service

Study Segment Direction	Existing Conditions				Existing plus Project			
	Weekday PM Peak		Weekend PM Peak		Weekday PM Peak		Weekend PM Peak	
	PTSF (%)	LOS	PTSF (%)	LOS	PTSF (%)	LOS	PTSF (%)	LOS
SR 29 - Zinfandel Ln to SR 128								
Northbound	86.2	E	87.6	E	86.3	E	87.5	E
Southbound	90.8	E	88.8	E	90.9	E	88.7	E

Notes: PTSF = Percent Time Spent Following; LOS = Level of Service

Finding – Since LOS E is acceptable within the rural communities in the County of Napa, the study roadway is expected to continue operating acceptably at the same levels of service upon the addition of project-generated traffic. Further, as the increase in percent time spent following is 0.1 percent, or a change of about 0.1 percent, the five-percent criterion used by the County would not be exceeded, making the impact acceptable.

Near-Term plus Project Conditions

Upon the addition of project-related traffic to Near-Term volumes, the study roadway segment is expected to operate at the same Level of Service as without. These results are summarized in Table 17.

Table 17 – Near-Term and Near-Term plus Project Peak Hour Roadway Segment Levels of Service

Study Segment Direction	Near-Term Conditions				Near-Term plus Project			
	Weekday PM Peak		Weekend PM Peak		Weekday PM Peak		Weekend PM Peak	
	PTSF (%)	LOS	PTSF (%)	LOS	PTSF (%)	LOS	PTSF (%)	LOS
SR 29 - Zinfandel Ln to SR 128								
Northbound	90.2	E	91.8	E	90.2	E	91.8	E
Southbound	93.5	E	92.2	E	93.5	E	92.2	E

Notes: PTSF = Percent Time Spent Following; LOS = Level of Service

Finding – The study roadways are expected to continue operating acceptably at the same levels of service upon the addition of project-generated traffic. As the change in percent time spent following would be about 0.1-percent, the effect on operation is considered acceptable.

Cumulative plus Project Conditions

With project-generated traffic added to the anticipated Cumulative volumes, the study roadway is expected to operate acceptably at LOS E with minor increases in delay. The Cumulative plus Project operating conditions are summarized in Table 18.

Table 18 – Cumulative and Cumulative plus Project Peak Hour Roadway Segment Levels of Service

Study Segment Direction	Cumulative Conditions				Cumulative plus Project			
	Weekday PM Peak		Weekend PM Peak		Weekday PM Peak		Weekend PM Peak	
	PTSF (%)	LOS	PTSF (%)	LOS	PTSF (%)	LOS	PTSF (%)	LOS
SR 29 - Zinfandel Ln to SR 128								
Northbound	89.5	E	91.2	E	89.5	E	91.2	E
Southbound	93.4	E	91.7	E	93.5	E	91.7	E

Notes: PTSF = Percent Time Spent Following; LOS = Level of Service

Finding – The study roadway will continue operating acceptably under the county's standard with project traffic added to future volumes. The 0.1 percent increase in percent time following would represent an acceptable effect on operation.

Travel Demand Analysis

Senate Bill (SB) 743 established a change in the metric to be applied to determining traffic impacts associated with development projects. Rather than the delay-based criteria associated with a Level of Service analysis, the increase in vehicle-miles-travelled (VMT) as a result of a project is now the basis for determining impacts, though the County did not have an adopted standard at the time this study was prepared. Vehicle miles traveled associated with the project were calculated by multiplying the estimated number of employee trips and the average home-to-work trip distance for the Traffic Analysis Zone (TAZ) in which the project is located. Using the daily trips generated for the proposed maximum of 20 full-time employees as determined using the County's winery trip generation form, and an average distance of 16.20 miles traveled per daily trip in the project's location as available from the Caltrans Statewide Travel Demand Model, the estimated VMT for the project is 988 vehicle miles traveled. These results are shown in Table 19.

Table 19 – VMT Summary

Land Use	Daily Employee Trips	Average Employee Trip Length	Calculated Daily VMT
Winery	61	16.20 mi	988

As VMT thresholds have not yet been established by the County of Napa, thus the recommendation from the Governor's Office of Planning and Research (OPR) to apply a 15-percent reduction threshold could be applied; however, as the County does not have published data for the countywide VMT average to which to apply this threshold, the 15 percent reduction was applied to the project's proposed operation. The following Travel Demand Management measures are recommended to reduce the project's trips generation and thus the associated VMT.

Vehicle Trip Reduction

The site is located in the rural community of Rutherford, in an area that contains numerous other wineries and tasting rooms, so the project is likely to attract a substantial amount of linked traffic from guests visiting multiple tasting rooms in the area rather than generating new trips associated with the project itself. As is typical with existing wineries in the area, visitors in large groups often arrange for their own private van or shuttle transportation, resulting in fewer trips to and from the site than might otherwise occur. This is a transportation demand measure that is a common means of transportation as most visitors intend to drink wine, which can impair driving abilities. While it is not recommended that the project site require the use of shuttles for large groups, it is recommended that when a large group makes a reservation, they should be encouraged to use private vans or a shuttle.

Carpooling should be promoted among employees, including with employees of other nearby wineries. This could be accomplished by adjusting work schedules to match neighboring wineries and coordinating with nearby businesses to create a database of interested persons. The County has adopted several measures in the General Plan to reduce vehicle trips through Transportation Demand Management (TDM) strategies: "The project should support programs to reduce single occupant vehicle use and encourage alternative travel modes." The winery has the ability to reduce the dependence on single vehicle occupancy trips to reduce peak hour trips. In support of employee carpooling, the Napa Valley Transportation Authority (NVTA) provides a Guaranteed Ride Home (GRH) program available to persons

who work in Napa County; this program provides funding for a taxi or ride-share trip that can be accessed as many as four times per year.

Finding – Transportation Demand Management techniques would need to be implemented to reduce impacts on VMT to a less-than-significant level. While there is not a published countywide average to which to compare the project's VMT, the VMT would be reduced by approximately 15 percent if three out of the 20 employees rode in a carpool on a daily basis.

Recommendation – It is recommended that when group reservations are made, staff encourage the guests to carpool or use a shuttle or van. Additionally, it is recommended that the winery implement a TDM plan to reduce vehicle trips by promoting employee carpooling.

Alternative Modes

Pedestrian Facilities

Given the rural location and type of land use, the lack of pedestrian facilities within the vicinity of the project site is adequate.

Finding – The lack of pedestrian facilities serving the project site is acceptable.

Bicycle Facilities

Existing bicycle facilities, including bike lanes on SR 29, together with shared use of minor streets and the planned extension of the Vine Trail provide adequate access for bicyclists.

Bicycle Storage

The site plan does not show plans for bicycle parking. The Napa County Code, Section 18.110.040, stipulates the following rate for bicycle parking requirements for non-residential projects:

- Zero bicycle parking spaces for zero to four required automobile parking spaces
- Two bicycle parking spaces for five to ten required automobile parking spaces
- Ten bicycle parking spaces for more than ten required automobile parking spaces

Finding – Bicycle parking is not indicated on the site plan.

Recommendation – Bicycle parking should be provided at the rate consistent with the requirements contained in the Napa County Code.

Transit

Existing transit routes and lack of transit stops is acceptable as the project would not be expected to generate transit trips given the rural location.

Finding – Transit facilities serving the project site are adequate.

Access and Circulation

Site Access

The site would be accessible via an existing driveway and an additional driveway which would be constructed at an angle. Both driveways connect to Galleron Road.

Sight Distance

At driveway approaches a substantially clear line of sight should be maintained between the driver of a vehicle waiting at the crossroad and the driver of an approaching vehicle. Sight distance along Galleron Road at the project driveways was evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. The recommended sight distance at a driveway is based on stopping sight distance, with the approach travel speed used as the basis for determining the recommended sight distance. Additionally, the stopping sight distance needed for a following driver to stop if there is a vehicle waiting to turn into a side street or driveway is evaluated based on stopping sight distance criterion and the approach speed on the major street.

Sight distance at the existing driveway was measured using aerial data from Google Earth. At the time of the study SARS-COVID-19 conditions prevented conducting a speed survey, so the *prima facie* limit of 55 mph would prevail. Given the narrow road width and short road length, it is likely vehicles will travel at a lower speed, but 55 mph was used to provide a conservative approach. For the design speed of 55 mph, the minimum stopping sight distance needed is 500 feet. Galleron Road is a flat road, and near the existing driveway there is low-lying brush and no obstructions to visibility of vehicles on the through street. From the proposed driveway sight lines of at least 500 feet are available in both directions. To ensure that adequate sight lines are maintained, any planned signage or landscaping at the project driveway should be placed outside of the driver's vision triangle.

Access Analysis

Left-Turn Lane Warrants

The need for a left-turn lane on Galleron Road at the project driveways was evaluated based on the County of Napa's published guidance for where a turn lane is needed based on the daily traffic volume projected to use the driveway as a function of roadway ADT (Average Daily Traffic). A left-turn lane meets warrants when the corresponding value plots above the curve indicated on the Left Turn Lane Warrant Graph from the *Napa County Road and Street Standards* and is unwarranted if the value plots below the curve.

While the proposed site would have two driveways, to be conservative all the project volumes were assumed to enter and exit the site via one driveway. The need for left-turn channelization in the form of a left-turn pocket on Galleron Road was evaluated based on Existing Friday and Saturday average daily traffic (ADT) along Galleron Road and at the project driveway as well as safety criteria. Under Existing plus Project conditions, which includes traffic associated with the already operational tasting room and traffic associated with harvest season together with the proposed increase in volumes, a left-turn lane is **not** warranted on Galleron Road at the project driveway during either the Friday or Saturday ADT. The Left-turn lane warrant graph is provided in Appendix F.

Conclusions and Recommendations

Conclusions

- The project is expected to generate an average of 45 new trips per weekday and 22 new trips on per weekend day during harvest. This would include 11 trips during the Friday p.m. peak hour and seven trips during the Saturday p.m. peak hour.
- The study intersection SR 29/Galleron Road is operating acceptably at LOS A overall and at LOS C at the stop-controlled approach. The segment of SR 29 between Zinfandel Lane and SR 128 is operating at LOS E, which is acceptable under County standards.
- With Near-Term project volumes added to Existing volumes, the study intersection and roadway would continue operating at the same Levels of Service. Future volume growth applied to the study intersection and roadway would result in minor increases in delay compared to Existing conditions and would both continue to operate acceptably at the same Levels of Service.
- With project generated volumes added, the study intersection and roadway would continue operating at the same Levels of Service as without for all three scenarios.
- The project is expected to generate a VMT of 988 miles. While the County has not adopted thresholds for significance, TDM measures should be implemented to reduce employee trips by 15 percent and encourage visitors to arrive in shuttles or vanpools to reduce VMT.
- Pedestrian, bicycle, and transit facilities are adequate to serve the anticipated demand.
- Sight lines at the existing and proposed driveways are adequate with the *prima facie* 55 mph design speed of Galleron Road.
- A left-turn lane would not be warranted on Galleron Road at the project driveway based on Existing plus Project Friday and Saturday during harvest ADT.

Recommendations

- It is recommended that when group reservations are made, staff encourage the guests to carpool or use a shuttle or van. Additionally, it is recommended that the winery implement a TDM plan to reduce vehicle trips by promoting employee carpooling.
- Bicycle parking should be provided on site at the rate specified in the County Code.
- Landscaping or signage along the frontage at the proposed and existing driveways should be placed outside of the driver's vision triangle and maintained.

Study Participants and References

Study Participants

Principal in Charge	Dalene J. Whitlock, PE, PTOE
Transportation Planner	Brian Canepa
Assistant Planner	Julia Walker
Graphics	Alex Scrobonia
Editing/Formatting	Hannah Yung-Boxdell
Quality Control	Dalene J. Whitlock, PE, PTOE

References

2016 Collision Data on California State Highways, California Department of Transportation, 2018

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Appendix A

Collision Rate Calculations

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Intersection Collision Rate Calculations

Sullivan Rutherford Estate Winery TIS

Intersection # 1: SR 29 & Galleron Rd
Date of Count: Friday, October 18, 2019

Number of Collisions: 5
Number of Injuries: 0
Number of Fatalities: 0
ADT: 20000
Start Date: October 1, 2014
End Date: September 30, 2019
Number of Years: 5

Intersection Type: Tee
Control Type: Stop & Yield Controls
Area: Rural

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{5 \times 1{,}000{,}000}{20{,}000 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.14 c/mve**	**0.0%**	**0.0%**
Statewide Average*	**0.16 c/mve**	**1.8%**	**39.5%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2016 Collision Data on California State Highways, Caltrans

SEGMENT COLLISION RATE CALCULATIONS

Sullivan Rutherford Estate Winery TIS

Location: SR 29 (Rutherford Rd to Zinfandel Ln)

Date of Count: Friday, October 18, 2019
ADT: 20,000

Number of Collisions: 55
Number of Injuries: 26
Number of Fatalities: 1
Start Date: October 1, 2014
End Date: September 30, 2019
Number of Years: 5

Highway Type: Conventional 2 lanes or less
Area: Rural
Design Speed: ≤55
Terrain: Flat

Segment Length: 2.0 miles
Direction: North/South

$$\frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Segment Length x Number of Years}}$$

$$\frac{55 \times 1{,}000{,}000}{20{,}000 \times 365 \times 2 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Segment	**0.75 c/mvm**	**1.8%**	**47.3%**
Statewide Average*	**0.81 c/mvm**	**1.1%**	**39.5%**

ADT = average daily traffic volume
c/mvm = collisions per million vehicle miles
* 2016 Collision Data on California State Highways, Caltrans

Appendix B

Intersection Level of Service Calculations

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Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	18.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.039

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	872	6	14	1080	10	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	872	6	14	1080	10	17
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	234	2	4	290	3	5
Total Analysis Volume [veh/h]	938	6	15	1161	11	18
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.02	0.01	0.04	0.06
d_M, Delay for Movement [s/veh]	0.00	0.00	10.06	0.00	18.34	16.69
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.06	0.00	0.18	0.18
95th-Percentile Queue Length [ft/ln]	0.00	0.00	1.58	0.00	4.47	4.47
d_A, Approach Delay [s/veh]	0.00		0.13		17.32	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.30					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Existing Friday PM Peak Conditions
W-Trans
4/21/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	17.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.041

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	919	22	12	955	14	11
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	919	22	12	955	14	11
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	247	6	3	257	4	3
Total Analysis Volume [veh/h]	988	24	13	1027	15	12
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.02	0.01	0.05	0.04
d_M, Delay for Movement [s/veh]	0.00	0.00	10.36	0.00	16.83	17.52
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.06	0.00	0.15	0.15
95th-Percentile Queue Length [ft/ln]	0.00	0.00	1.45	0.00	3.77	3.77
d_A, Approach Delay [s/veh]	0.00		0.13		17.13	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.29					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Existing Saturday PM Peak Conditions
W-Trans
4/21/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	22.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.050

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	872	6	14	1080	10	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	186	0	1	186	0	2
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1058	6	15	1266	10	19
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	284	2	4	340	3	5
Total Analysis Volume [veh/h]	1138	6	16	1361	11	20
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.03	0.01	0.05	0.08
d_M, Delay for Movement [s/veh]	0.00	0.00	11.05	0.00	22.18	20.59
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.08	0.00	0.27	0.27
95th-Percentile Queue Length [ft/ln]	0.00	0.00	2.02	0.00	6.65	6.65
d_A, Approach Delay [s/veh]	0.00		0.13		21.15	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.33					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Near Term Friday PM Peak
W-Trans
5/14/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	22.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.086

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	919	22	12	955	14	11
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	199	7	7	198	7	7
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1118	29	19	1153	21	18
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	301	8	5	310	6	5
Total Analysis Volume [veh/h]	1202	31	20	1240	23	19
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.04	0.01	0.10	0.09
d_M, Delay for Movement [s/veh]	0.00	0.00	11.60	0.00	20.87	22.21
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.11	0.00	0.32	0.32
95th-Percentile Queue Length [ft/ln]	0.00	0.00	2.75	0.00	7.90	7.90
d_A, Approach Delay [s/veh]	0.00		0.18		21.48	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.45					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Near Term Saturday PM Peak
W-Trans
5/14/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	22.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.059

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	872	6	14	1080	10	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.2600	1.2600	1.2600	1.2600	1.2600	1.2600
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1099	8	18	1361	13	21
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	275	2	5	340	3	5
Total Analysis Volume [veh/h]	1099	8	18	1361	13	21
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.03	0.01	0.06	0.08
d_M, Delay for Movement [s/veh]	0.00	0.00	10.88	0.00	22.17	19.77
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.09	0.00	0.27	0.27
95th-Percentile Queue Length [ft/ln]	0.00	0.00	2.20	0.00	6.64	6.64
d_A, Approach Delay [s/veh]	0.00		0.14		20.69	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.36					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Cummulative Friday PM Peak
W-Trans
5/14/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	21.0
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.060

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	919	22	12	955	14	11
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.2600	1.2600	1.2600	1.2600	1.2600	1.2600
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1158	28	15	1203	18	14
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	290	7	4	301	5	4
Total Analysis Volume [veh/h]	1158	28	15	1203	18	14
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.03	0.01	0.07	0.06
d_M, Delay for Movement [s/veh]	0.00	0.00	11.27	0.00	19.73	20.97
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.08	0.00	0.23	0.23
95th-Percentile Queue Length [ft/ln]	0.00	0.00	1.96	0.00	5.67	5.67
d_A, Approach Delay [s/veh]	0.00		0.14		20.27	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.34					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Cummulative Saturday PM Peak
W-Trans
5/14/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	18.6
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.051

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	872	6	14	1080	10	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	2	2	0	3	4
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	872	8	16	1080	13	21
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	234	2	4	290	3	6
Total Analysis Volume [veh/h]	938	9	17	1161	14	23
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.02	0.01	0.05	0.07
d_M, Delay for Movement [s/veh]	0.00	0.00	10.09	0.00	18.56	16.84
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.07	0.00	0.23	0.23
95th-Percentile Queue Length [ft/ln]	0.00	0.00	1.80	0.00	5.81	5.81
d_A, Approach Delay [s/veh]	0.00		0.15		17.49	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.38					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Existing Friday PM Peak plus Project
W-Trans
4/21/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	17.6
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.047

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	919	22	12	955	14	11
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	1	2	0	2	2
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	919	23	14	955	16	13
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	247	6	4	257	4	3
Total Analysis Volume [veh/h]	988	25	15	1027	17	14
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.02	0.01	0.05	0.05
d_M, Delay for Movement [s/veh]	0.00	0.00	10.38	0.00	16.93	17.57
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.07	0.00	0.17	0.17
95th-Percentile Queue Length [ft/ln]	0.00	0.00	1.68	0.00	4.32	4.32
d_A, Approach Delay [s/veh]	0.00		0.15		17.22	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.33					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Existing Saturday PM Peak plus Project
W-Trans
4/21/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	22.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.064

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	872	6	14	1080	10	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	186	2	3	186	3	6
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1058	8	17	1266	13	23
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	284	2	5	340	3	6
Total Analysis Volume [veh/h]	1138	9	18	1361	14	25
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	1
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	10

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.03	0.01	0.06	0.10
d_M, Delay for Movement [s/veh]	0.00	0.00	11.09	0.00	22.54	20.85
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.09	0.00	0.34	0.34
95th-Percentile Queue Length [ft/ln]	0.00	0.00	2.28	0.00	8.50	8.50
d_A, Approach Delay [s/veh]	0.00		0.14		21.46	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.40					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Near Term Friday PM Peak plus Project
W-Trans
5/14/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	22.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.100

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	919	22	12	955	14	11
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	199	8	9	198	9	9
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1118	30	21	1153	23	20
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	301	8	6	310	6	5
Total Analysis Volume [veh/h]	1202	32	23	1240	25	22
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.04	0.01	0.11	0.10
d_M, Delay for Movement [s/veh]	0.00	0.00	11.65	0.00	21.09	22.30
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.13	0.00	0.35	0.35
95th-Percentile Queue Length [ft/ln]	0.00	0.00	3.18	0.00	8.75	8.75
d_A, Approach Delay [s/veh]	0.00		0.21		21.65	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.51					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Near Term Saturday PM Peak plus Project
W-Trans
5/14/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	22.4
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.073

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	872	6	14	1080	10	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.2600	1.2600	1.2600	1.2600	1.2600	1.2600
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	2	2	0	3	4
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1099	10	20	1361	16	25
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	275	3	5	340	4	6
Total Analysis Volume [veh/h]	1099	10	20	1361	16	25
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.03	0.01	0.07	0.10
d_M, Delay for Movement [s/veh]	0.00	0.00	10.91	0.00	22.45	19.95
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.10	0.00	0.32	0.32
95th-Percentile Queue Length [ft/ln]	0.00	0.00	2.46	0.00	8.04	8.04
d_A, Approach Delay [s/veh]	0.00		0.16		20.92	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.43					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Cummulative Friday PM Peak plus Project
W-Trans
5/14/2020

Intersection Level Of Service Report
Intersection 1: SR 29/Galleron Rd

Control Type:	Two-way stop	Delay (sec / veh):	21.1
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.068

Intersection Setup

Name	SR 29		SR 29		Galleron Rd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	SR 29		SR 29		Galleron Rd	
Base Volume Input [veh/h]	919	22	12	955	14	11
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.2600	1.2600	1.2600	1.2600	1.2600	1.2600
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	1	2	0	2	2
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1158	29	17	1203	20	16
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	290	7	4	301	5	4
Total Analysis Volume [veh/h]	1158	29	17	1203	20	16
Pedestrian Volume [ped/h]	0		0		0	

Generated with PTV VISTRO
Version 7.00-05

Intersection Settings

Priority Scheme	Free		Free		Stop	
Flared Lane					Yes	
Storage Area [veh]	0		0		1	
Two-Stage Gap Acceptance					Yes	
Number of Storage Spaces in Median	0		0		10	

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.03	0.01	0.08	0.07
d_M, Delay for Movement [s/veh]	0.00	0.00	11.30	0.00	19.88	21.05
Movement LOS	A	A	B	A	C	C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.09	0.00	0.26	0.26
95th-Percentile Queue Length [ft/ln]	0.00	0.00	2.23	0.00	6.40	6.40
d_A, Approach Delay [s/veh]	0.00		0.16		20.40	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.38					
Intersection LOS	C					

TIS Sullivan Rutherford Estate Winery
Cummulative Saturday PM Peak + Project
W-Trans
5/14/2020

Appendix C

Roadway Segment Level of Service Calculations

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HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2019
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	895	veh/h
Opposing direction volume, Vo	1104	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	962	pc/h	1187	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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	40.5	mi/h
Percent Free Flow Speed, PFFS	69.5	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	962	pc/h	1187	pc/h
Base percent time-spent-following,(note-4) BPTSFd	79.0	%		
Adjustment for no-passing zones, fnp	16.1			
Percent time-spent-following, PTSFd	86.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.57	
Peak 15-min vehicle-miles of travel, VMT15	481	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1790	veh-mi
Peak 15-min total travel time, TT15	11.9	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	40.5	mi/h
Percent time-spent-following, PTSFd (from above)	86.2	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	962.4
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.47
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2019
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	1104	veh/h
Opposing direction volume, Vo	895	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1187	pc/h	962	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.2	mi/h
Average travel speed, ATSd	40.1	mi/h
Percent Free Flow Speed, PFFS	69.2	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1187	pc/h	962	pc/h
Base percent time-spent-following,(note-4) BPTSFd	81.9	%		
Adjustment for no-passing zones, fnp	16.1			
Percent time-spent-following, PTSFd	90.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.70	
Peak 15-min vehicle-miles of travel, VMT15	594	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2208	veh-mi
Peak 15-min total travel time, TT15	14.8	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	40.1	mi/h
Percent time-spent-following, PTSFd (from above)	90.8	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1187.1
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.57
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2019
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	952	veh/h
Opposing direction volume, Vo	981	veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor,(note-5) fHV	1.000	1.000
Grade adj. factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1024 pc/h	1055 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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	41.0	mi/h
Percent Free Flow Speed, PFFS	70.4	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1024 pc/h	1055 pc/h
Base percent time-spent-following,(note-4) BPTSFd	78.9 %	
Adjustment for no-passing zones, fnp	17.6	
Percent time-spent-following, PTSFd	87.6 %	

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.60	
Peak 15-min vehicle-miles of travel, VMT15	512	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1904	veh-mi
Peak 15-min total travel time, TT15	12.5	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	41.0	mi/h
Percent time-spent-following, PTSFd (from above)	87.6	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1023.7
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.50
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2019
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	981	veh/h
Opposing direction volume, Vo	952	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1055	pc/h	1024	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	40.7	mi/h
Percent Free Flow Speed, PFFS	70.2	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1055	pc/h	1024	pc/h
Base percent time-spent-following,(note-4) BPTSFd	79.9	%		
Adjustment for no-passing zones, fnp	17.6			
Percent time-spent-following, PTSFd	88.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.62	
Peak 15-min vehicle-miles of travel, VMT15	527	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1962	veh-mi
Peak 15-min total travel time, TT15	12.9	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	40.7	mi/h
Percent time-spent-following, PTSFd (from above)	88.8	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1054.8
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.51
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2019 + Near Term Projects
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	1083	veh/h
Opposing direction volume, Vo	1292	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1165	pc/h	1389	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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h
Average travel speed, ATSd	37.5	mi/h
Percent Free Flow Speed, PFFS	64.4	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1165	pc/h	1389	pc/h
Base percent time-spent-following,(note-4) BPTSFd	85.2	%		
Adjustment for no-passing zones, fnp	10.9			
Percent time-spent-following, PTSFd	90.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.69	
Peak 15-min vehicle-miles of travel, VMT15	582	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2166	veh-mi
Peak 15-min total travel time, TT15	15.5	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.5	mi/h
Percent time-spent-following, PTSFd (from above)	90.2	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1164.5
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.56
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2019 + Near Term Projects
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	1292	veh/h
Opposing direction volume, Vo	1083	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1389	pc/h	1165	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	37.1	mi/h
Percent Free Flow Speed, PFFS	64.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1389	pc/h	1165	pc/h
Base percent time-spent-following,(note-4) BPTSFd	87.6	%		
Adjustment for no-passing zones, fnp	10.9			
Percent time-spent-following, PTSFd	93.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.82	
Peak 15-min vehicle-miles of travel, VMT15	695	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2584	veh-mi
Peak 15-min total travel time, TT15	18.7	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.1	mi/h
Percent time-spent-following, PTSFd (from above)	93.5	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1389.2
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.65
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2019 + Near Term Projects
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	1165	veh/h
Opposing direction volume, Vo	1192	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1253	pc/h	1282	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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h
Average travel speed, ATSd	37.6	mi/h
Percent Free Flow Speed, PFFS	64.5	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1253	pc/h	1282	pc/h
Base percent time-spent-following,(note-4) BPTSFd	86.3	%		
Adjustment for no-passing zones, fnp	11.2			
Percent time-spent-following, PTSFd	91.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.74	
Peak 15-min vehicle-miles of travel, VMT15	626	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2330	veh-mi
Peak 15-min total travel time, TT15	16.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.6	mi/h
Percent time-spent-following, PTSFd (from above)	91.8	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1252.7
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.60
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2019 + Near Term Projects
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	1192	veh/h
Opposing direction volume, Vo	1165	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1282	pc/h	1253	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h
Average travel speed, ATSd	37.3	mi/h
Percent Free Flow Speed, PFFS	64.3	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1282	pc/h	1253	pc/h
Base percent time-spent-following,(note-4) BPTSFd	86.5	%		
Adjustment for no-passing zones, fnp	11.2			
Percent time-spent-following, PTSFd	92.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.75	
Peak 15-min vehicle-miles of travel, VMT15	641	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2384	veh-mi
Peak 15-min total travel time, TT15	17.2	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.3	mi/h
Percent time-spent-following, PTSFd (from above)	92.2	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1281.7
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.61
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2040
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	1.00	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	1128	veh/h
Opposing direction volume, Vo	1391	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1128	pc/h	1391	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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h
Average travel speed, ATSd	37.8	mi/h
Percent Free Flow Speed, PFFS	64.9	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1128	pc/h	1391	pc/h
Base percent time-spent-following,(note-4) BPTSFd	84.4	%		
Adjustment for no-passing zones, fnp	11.3			
Percent time-spent-following, PTSFd	89.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.66	
Peak 15-min vehicle-miles of travel, VMT15	564	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2256	veh-mi
Peak 15-min total travel time, TT15	14.9	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.8	mi/h
Percent time-spent-following, PTSFd (from above)	89.5	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1128.0
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.58
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2040
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	1.00	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	1391	veh/h
Opposing direction volume, Vo	1128	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1391	pc/h	1128	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	37.4	mi/h
Percent Free Flow Speed, PFFS	64.4	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1391	pc/h	1128	pc/h
Base percent time-spent-following,(note-4) BPTSFd	87.2	%		
Adjustment for no-passing zones, fnp	11.3			
Percent time-spent-following, PTSFd	93.4	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.82	
Peak 15-min vehicle-miles of travel, VMT15	696	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2782	veh-mi
Peak 15-min total travel time, TT15	18.6	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.4	mi/h
Percent time-spent-following, PTSFd (from above)	93.4	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1391.0
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.65
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2040
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	1.00	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	1200	veh/h
Opposing direction volume, Vo	1236	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1200	pc/h	1236	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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h
Average travel speed, ATSd	38.3	mi/h
Percent Free Flow Speed, PFFS	65.8	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1200	pc/h	1236	pc/h
Base percent time-spent-following,(note-4) BPTSFd	85.0	%		
Adjustment for no-passing zones, fnp	12.6			
Percent time-spent-following, PTSFd	91.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.71	
Peak 15-min vehicle-miles of travel, VMT15	600	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2400	veh-mi
Peak 15-min total travel time, TT15	15.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	38.3	mi/h
Percent time-spent-following, PTSFd (from above)	91.2	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1200.0
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.58
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2040
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	1.00	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	1236	veh/h
Opposing direction volume, Vo	1200	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1236	pc/h	1200	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	38.0	mi/h
Percent Free Flow Speed, PFFS	65.6	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1236	pc/h	1200	pc/h
Base percent time-spent-following,(note-4) BPTSFd	85.3	%		
Adjustment for no-passing zones, fnp	12.6			
Percent time-spent-following, PTSFd	91.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.73	
Peak 15-min vehicle-miles of travel, VMT15	618	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2472	veh-mi
Peak 15-min total travel time, TT15	16.2	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	38.0	mi/h
Percent time-spent-following, PTSFd (from above)	91.7	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1236.0
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.59
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour + Project
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2019
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	900	veh/h
Opposing direction volume, Vo	1110	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	968	pc/h	1194	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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	40.4	mi/h
Percent Free Flow Speed, PFFS	69.4	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	968	pc/h	1194	pc/h
Base percent time-spent-following,(note-4) BPTSFd	79.2	%		
Adjustment for no-passing zones, fnp	15.9			
Percent time-spent-following, PTSFd	86.3	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.57	
Peak 15-min vehicle-miles of travel, VMT15	484	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1800	veh-mi
Peak 15-min total travel time, TT15	12.0	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	40.4	mi/h
Percent time-spent-following, PTSFd (from above)	86.3	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	967.7
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.47
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour + Project
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2019
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	1110	veh/h
Opposing direction volume, Vo	900	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1194	pc/h	968	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.2	mi/h
Average travel speed, ATSd	40.0	mi/h
Percent Free Flow Speed, PFFS	69.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1194	pc/h	968	pc/h
Base percent time-spent-following,(note-4) BPTSFd	82.1	%		
Adjustment for no-passing zones, fnp	15.9			
Percent time-spent-following, PTSFd	90.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.70	
Peak 15-min vehicle-miles of travel, VMT15	597	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2220	veh-mi
Peak 15-min total travel time, TT15	14.9	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	40.0	mi/h
Percent time-spent-following, PTSFd (from above)	90.9	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1193.5
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.58
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour +Project
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2019
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	955	veh/h
Opposing direction volume, Vo	985	veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor,(note-5) fHV	1.000	1.000
Grade adj. factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1027 pc/h	1059 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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	40.9	mi/h
Percent Free Flow Speed, PFFS	70.3	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1027 pc/h	1059 pc/h
Base percent time-spent-following,(note-4) BPTSFd	78.9 %	
Adjustment for no-passing zones, fnp	17.5	
Percent time-spent-following, PTSFd	87.5 %	

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.60	
Peak 15-min vehicle-miles of travel, VMT15	513	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1910	veh-mi
Peak 15-min total travel time, TT15	12.5	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	40.9	mi/h
Percent time-spent-following, PTSFd (from above)	87.5	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1026.9
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.50
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour +Project
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2019
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	985	veh/h
Opposing direction volume, Vo	955	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1059	pc/h	1027	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	40.7	mi/h
Percent Free Flow Speed, PFFS	70.1	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1059	pc/h	1027	pc/h
Base percent time-spent-following,(note-4) BPTSFd	79.8	%		
Adjustment for no-passing zones, fnp	17.5			
Percent time-spent-following, PTSFd	88.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.62	
Peak 15-min vehicle-miles of travel, VMT15	530	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1970	veh-mi
Peak 15-min total travel time, TT15	13.0	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	40.7	mi/h
Percent time-spent-following, PTSFd (from above)	88.7	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1059.1
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.52
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour + Project
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2019 + Near Term Projects
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	1088	veh/h
Opposing direction volume, Vo	1298	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1170	pc/h	1396	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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h
Average travel speed, ATSd	37.4	mi/h
Percent Free Flow Speed, PFFS	64.3	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1170	pc/h	1396	pc/h
Base percent time-spent-following,(note-4) BPTSFd	85.3	%		
Adjustment for no-passing zones, fnp	10.7			
Percent time-spent-following, PTSFd	90.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.69	
Peak 15-min vehicle-miles of travel, VMT15	585	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2176	veh-mi
Peak 15-min total travel time, TT15	15.6	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.4	mi/h
Percent time-spent-following, PTSFd (from above)	90.2	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1169.9
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.57
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour + Project
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2019 + Near Term Projects
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	1298	veh/h
Opposing direction volume, Vo	1088	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1396	pc/h	1170	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	37.0	mi/h
Percent Free Flow Speed, PFFS	63.8	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1396	pc/h	1170	pc/h
Base percent time-spent-following,(note-4) BPTSFd	87.7	%		
Adjustment for no-passing zones, fnp	10.7			
Percent time-spent-following, PTSFd	93.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.82	
Peak 15-min vehicle-miles of travel, VMT15	698	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2596	veh-mi
Peak 15-min total travel time, TT15	18.9	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.0	mi/h
Percent time-spent-following, PTSFd (from above)	93.5	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1395.7
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.66
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour +Project
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2019 + Near Term Projects
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	1168	veh/h
Opposing direction volume, Vo	1196	veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor,(note-5) fHV	1.000	1.000
Grade adj. factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1256 pc/h	1286 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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h
Average travel speed, ATSd	37.5	mi/h
Percent Free Flow Speed, PFFS	64.4	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	1256 pc/h	1286 pc/h
Base percent time-spent-following,(note-4) BPTSFd	86.3 %	
Adjustment for no-passing zones, fnp	11.1	
Percent time-spent-following, PTSFd	91.8 %	

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.74	
Peak 15-min vehicle-miles of travel, VMT15	628	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2336	veh-mi
Peak 15-min total travel time, TT15	16.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.5	mi/h
Percent time-spent-following, PTSFd (from above)	91.8	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1255.9
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.60
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour +Project
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2019 + Near Term Projects
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	1196	veh/h
Opposing direction volume, Vo	1168	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1286	pc/h	1256	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h
Average travel speed, ATSd	37.3	mi/h
Percent Free Flow Speed, PFFS	64.2	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1286	pc/h	1256	pc/h
Base percent time-spent-following,(note-4) BPTSFd	86.6	%		
Adjustment for no-passing zones, fnp	11.1			
Percent time-spent-following, PTSFd	92.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.76	
Peak 15-min vehicle-miles of travel, VMT15	643	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2392	veh-mi
Peak 15-min total travel time, TT15	17.3	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.3	mi/h
Percent time-spent-following, PTSFd (from above)	92.2	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1286.0
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.61
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour + Project
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2040
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	1.00	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	1133	veh/h
Opposing direction volume, Vo	1397	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1133	pc/h	1397	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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h
Average travel speed, ATSd	37.7	mi/h
Percent Free Flow Speed, PFFS	64.7	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1133	pc/h	1397	pc/h
Base percent time-spent-following,(note-4) BPTSFd	84.5	%		
Adjustment for no-passing zones, fnp	11.2			
Percent time-spent-following, PTSFd	89.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.67	
Peak 15-min vehicle-miles of travel, VMT15	567	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2266	veh-mi
Peak 15-min total travel time, TT15	15.0	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.7	mi/h
Percent time-spent-following, PTSFd (from above)	89.5	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1133.0
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.55
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Friday PM Peak Hour + Project
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2040
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	1.00	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd	1397	veh/h
Opposing direction volume, Vo	1133	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1397	pc/h	1133	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	37.3	mi/h
Percent Free Flow Speed, PFFS	64.3	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1397	pc/h	1133	pc/h
Base percent time-spent-following,(note-4) BPTSFd	87.3	%		
Adjustment for no-passing zones, fnp	11.2			
Percent time-spent-following, PTSFd	93.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.82	
Peak 15-min vehicle-miles of travel, VMT15	699	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2794	veh-mi
Peak 15-min total travel time, TT15	18.8	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	37.3	mi/h
Percent time-spent-following, PTSFd (from above)	93.5	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1397.0
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.66
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour +Project
Highway	SR 29 - NB
From/To	Rutherford Rd/Zinfandel Ln
Jurisdiction	County of Napa
Analysis Year	2040
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	1.00	
Shoulder width	7.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	4	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd	1203	veh/h
Opposing direction volume, Vo	1240	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1203	pc/h	1240	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	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	58.3	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h
Average travel speed, ATSd	38.3	mi/h
Percent Free Flow Speed, PFFS	65.7	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1203	pc/h	1240	pc/h
Base percent time-spent-following,(note-4) BPTSFd	85.0	%		
Adjustment for no-passing zones, fnp	12.5			
Percent time-spent-following, PTSFd	91.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.71	
Peak 15-min vehicle-miles of travel, VMT15	602	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2406	veh-mi
Peak 15-min total travel time, TT15	15.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	38.3	mi/h
Percent time-spent-following, PTSFd (from above)	91.2	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1203.0
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.58
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Julia Walker
Agency/Co.	W-Trans
Date Performed	4/16/2020
Analysis Time Period	Saturday PM Peak Hour +Project
Highway	SR 29 - SB
From/To	Zinfandel Ln/Rutherford Rd
Jurisdiction	County of Napa
Analysis Year	2040
Description	TIS Sullivan Rutherford Estate

Input Data

Highway class	Class 2		Peak hour factor, PHF	1.00		
Shoulder width	7.0	ft	% Trucks and buses	6	%	
Lane width	12.0	ft	% Trucks crawling	0.0	%	
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr	
Terrain type	Level		% Recreational vehicles	4	%	
Grade: Length	-	mi	% No-passing zones	100	%	
Up/down	-	%	Access point density	8	/mi	

Analysis direction volume, Vd	1240	veh/h
Opposing direction volume, Vo	1203	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		1.000	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1240	pc/h	1203	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	60.0	mi/h

Adj. for lane and shoulder width,(note-3) fLS	0.0	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	58.0	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSd	38.0	mi/h
Percent Free Flow Speed, PFFS	65.5	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	1240	pc/h	1203	pc/h
Base percent time-spent-following,(note-4) BPTSFd	85.4	%		
Adjustment for no-passing zones, fnp	12.5			
Percent time-spent-following, PTSFd	91.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.73	
Peak 15-min vehicle-miles of travel, VMT15	620	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2480	veh-mi
Peak 15-min total travel time, TT15	16.3	veh-h
Capacity from ATS, CdATS	0	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.0	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)	38.0	mi/h
Percent time-spent-following, PTSFd (from above)	91.7	
Level of service, LOSd (from above)	E	

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	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	1240.0
Effective width of outside lane, We	26.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.60
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Appendix D

Near-Term Project Trip Generation Forms

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Existing Conditions Winery Traffic Information / Trip Generation

Determine Winery Daily Trips. ***Complete Sections A through H below to determine your winery project's estimated baseline daily and peak hour trips.***

Project Name: Piazza Del Dotto Winery **Project Scenario:** **Permitted**

Section A. Maximum Daily Weekday Traffic (Friday, non-harvest season)

1.	Total number of FT employees:	13	x 3.05 one-way trips per employee	=	39.7	daily trips
2.	Total number of PT employees:	2	x 1.90 one-way trips per employee	=	3.8	daily trips
3.	Maximum weekday visitors:	50	/2.6 visitors per vehicle x 2 one-way trips	=	38.5	daily trips
4.	Gallons of production: 48000		/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	0.9	daily trips
5.			TOTAL	=	83	daily trips

Section B. Maximum Daily Weekday Traffic (Friday, harvest season)

6.	Total number of FT employees:	13	x 3.05 one-way trips per employee	=	39.7	daily trips
7.	Total number of PT employees:	2	x 1.90 one-way trips per employee	=	3.8	daily trips
8.	Maximum weekday visitors:	50	/2.6 visitors per vehicle x 2 one-way trips	=	38.5	daily trips
9.	Gallons of production: 48000		/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	0.9	daily trips
10.	Avg. annual tons of grape on-haul:	320	/ 144 truck trips x 2 one-way trips	=	4.4	daily trips
11.			TOTAL	=	87	daily trips

Section C. Maximum Daily Weekend Traffic (Saturday, non-harvest season)

12.	Total number of FT Sat. employees:	13	x 3.05 one-way trips per employee	=	39.7	daily trips
13.	Total number of PT Sat. employees:	0	x 1.90 one-way trips per employee	=	0.0	daily trips
14.	Maximum Saturday visitors:	75	/2.8 visitors per vehicle x 2 one-way trips	=	53.6	daily trips
15.			TOTAL	=	93	daily trips

Section D. Maximum Daily Weekend Traffic (Saturday, harvest season)

16.	Total number of FT Sat. employees:	13	x 3.05 one-way trips per employee	=	39.7	daily trips
17.	Total number of PT Sat. employees:	2	x 1.90 one-way trips per employee	=	3.8	daily trips
18.	Maximum Saturday visitors:	75	/2.8 visitors per vehicle x 2 one-way trips	=	53.6	daily trips
19.	Gallons of production: 48000		/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	0.9	daily trips
20.	Avg. annual tons of grape on-haul:	320	/ 144 truck trips x 2 one-way trips	=	4.4	daily trips
21.			TOTAL	=	102	daily trips

Section E. PM Peak Hour Trip Generation (Friday, non-harvest season)

(Sum of daily trips from Sec. A, lines 3 and 4) x 0.38 + (No. of FTE) + (No. of PTE / 2) = 29 PM peak trips

Section F. PM Peak Hour Trip Generation (Friday, harvest season)

(Sum of daily trips, Sec. B, lines 8, 9, 10) x 0.38 + (No. of FTE) + (No. of PTE / 2) = 31 PM peak trips

Section G. PM Peak Hour Trip Generation (Friday, non-harvest season)

(Daily trips from Sec. C, line 14) x 0.57 + (No. of FTE) + (No. of PTE / 2) = 44 PM peak trips

Section H. PM Peak Hour Trip Generation (Saturday, harvest season)

(Sum of daily trips Sec. D, lines 18, 19, 20) x 0.57 + (No. of FTE) + (No. of PTE / 2) = 48 PM peak trips

Proposed Project Winery Traffic Information / Trip Generation

Determine Winery Daily Trips. ***Complete Sections I through L below to determine your winery project's estimated future and peak hour trips.***

Section I. Maximum Daily Weekday Traffic (Friday, non-harvest season)

1.	Total number of FT employees:	17	x 3.05 one-way trips per employee		=	51.9	daily trips
2.	Total number of PT employees:	2	x 1.90 one-way trips per employee		=	3.8	daily trips
3.	Maximum weekday visitors:	125	/2.6 visitors per vehicle x 2 one-way trips		=	96.2	daily trips
4.	Gallons of production:	100000	/1,000 x 0.009 daily truck trips2 x 2 one-way trips		=	1.8	daily trips
5.				TOTAL	=	154	daily trips

Section J. Maximum Daily Weekday Traffic (Friday, harvest season)

6.	Total number of FT employees:	17	x 3.05 one-way trips per employee		=	51.9	daily trips
7.	Total number of PT employees:	2	x 1.90 one-way trips per employee		=	3.8	daily trips
8.	Maximum weekday visitors:	125	/2.6 visitors per vehicle x 2 one-way trips		=	96.2	daily trips
9.	Gallons of production:	100000	/1,000 x 0.009 daily truck trips2 x 2 one-way trips		=	1.8	daily trips
10.	Avg. annual tons of grape on-haul:	667	/ 144 truck trips x 2 one-way trips		=	9.3	daily trips
11.				TOTAL	=	163	daily trips

Section K. Maximum Daily Weekend Traffic (Saturday, non-harvest season)

12.	Total number of FT Sat. employees:	13	x 3.05 one-way trips per employee		=	39.7	daily trips
13.	Total number of PT Sat. employees:	0	x 1.90 one-way trips per employee		=	0.0	daily trips
14.	Maximum Saturday visitors:	130	/2.8 visitors per vehicle x 2 one-way trips		=	92.9	daily trips
15.				TOTAL	=	133	daily trips

Section L. Maximum Daily Weekend Traffic (Saturday, harvest season)

16.	Total number of FT Sat. employees:	17	x 3.05 one-way trips per employee		=	51.9	daily trips
17.	Total number of PT Sat. employees:	2	x 1.90 one-way trips per employee		=	3.8	daily trips
18.	Maximum Saturday visitors:	130	/2.8 visitors per vehicle x 2 one-way trips		=	92.9	daily trips
19.	Gallons of production:	100000	/1,000 x 0.009 daily truck trips2 x 2 one-way trips		=	1.8	daily trips
20.	Avg. annual tons of grape on-haul:	667	/ 144 truck trips x 2 one-way trips		=	9.3	daily trips
21.				TOTAL	=	160	daily trips

Section M. PM Peak Hour Trip Generation (Friday, non-harvest season)

(Sum of daily trips from Sec. I, lines 3 and 4) x 0.38 + (No. of FTE) + (No. of PTE / 2) = 55 PM peak trips

Section N. PM Peak Hour Trip Generation (Friday, harvest season)

(Sum of daily trips, Sec. J, lines 8, 9, 10) x 0.38 + (No. of FTE) + (No. of PTE / 2) = 59 PM peak trips

Section O. PM Peak Hour Trip Generation (Friday, non-harvest season)

(Daily trips from Sec. K, line 14) x 0.57 + (No. of FTE) + (No. of PTE / 2) = 66 PM peak trips

Section P. PM Peak Hour Trip Generation (Saturday, harvest season)

(Sum of daily trips Sec. L, lines 18, 19, 20) x 0.57 + (No. of FTE) + (No. of PTE / 2) = 77 PM peak trips

Bommarito Winery

Proposed Project Winery Traffic Information / Trip Generation Sheet

Maximum Daily Weekday Traffic (non-harvest season)

Total number of FT employees: 3 x3.05 one-way trips per employee = **9.2** daily trips.

Total number of PT employees: 3 x1.90 one-way trips per employee = **5.7** daily trips.

Anticipated weekday visitors: 15 / 2.6 visitors per vehicle x 2 one-way trips = **39** daily trips.

Gallons of production: 30,000 / 1,000 x .009 truck trips daily[3] x 2 one-way trips = **.54** daily trips.

Total = **49** **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38) = **3.6** **PM peak trips.**

Maximum Daily Weekend Traffic (non-harvest Saturday)

Number of FT employees (on Saturdays): 3 x 3.05 one-way trips per employee = **9.2** daily trips.

Number of PT employees (on Saturdays): 0 x 1.90 one-way trips per employee = **0** daily trips.

Anticipated Saturday visitors: 15 / 2.8 visitors per vehicle x 2 one-way trips = **10.7** daily trips.

Total = **19.9** **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57) = **15.8** **PM peak trips.**

Maximum Daily Weekend Traffic – Saturday Harvest Season

Number of FT employees (during crush): 3 x 3.05 one-way trips per employee = **9.2** daily trips.

Number of PT employees (during crush): 3 x 1.90 one-way trips per employee = **5.7** daily trips.

Anticipated Saturday visitors: 15 / 2.8 visitors per vehicle x 2 one-way trips = **10.7** daily trips.

Gallons of production: 30,000 / 1,000 x .009 truck trips daily x 2 one-way trips = **.54** daily trips.

Avg. annual tons of grape on-haul: 4 / 144 truck trips daily[4] x 2 one-way trips = **.88** daily trips.

Total = **27** **daily trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): 4 x 2 one-way trips per staff person = **8** 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): 2 x 2 one-way trips = **4** trips.

Traffic Information Sheet Addendum

Winery Traffic Information / Trip Generation Sheet

Traffic during a Typical Weekday

Number of FT employees: 12 x 3.05 one-way trips per employee = 36.60 daily trips.

Number of PT employees: 3 x 1.90 one-way trips per employee = 5.70 daily trips.

Average number of weekday visitors: 63 / 2.6 visitors per vehicle x 2 one-way trips = 48.46 daily trips.

Gallons of production: 125,000 / 1,000 x .009 truck trips daily[3] x 2 one-way trips = 2.25 daily trips.

Total = 93.01 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38) = 32.77 **PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays): 4 x 3.05 one-way trips per employee = 12.20 daily trips.

Number of PT employees (on Saturdays): 2 x 1.90 one-way trips per employee = 3.80 daily trips.

Average number of Saturday visitors: 95 / 2. 8 visitors per vehicle x 2 one-way trips = 67.86 daily trips.

Total = 83.86 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57) = 43.68 **PM peak trips.**

Traffic during a Crush Saturday

Number of FT employees (during crush): 8 x 3.05 one-way trips per employee = 24.40 daily trips.

Number of PT employees (during crush): 4 x 1.90 one-way trips per employee = 7.60 daily trips.

Average number of Saturday visitors: 50 / 2. 8 visitors per vehicle x 2 one-way trips = 35.71 daily trips.

Gallons of production: 125,000 / 1,000 x .009 truck trips daily x 2 one-way trips = 2.25 daily trips.

Avg. annual tons of grape on-haul: 271 / 144 truck trips daily[4] x 2 one-way trips = 3.76 daily trips.

Total = 73.72 **daily trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): 6 x 2 one-way trips per staff person = 12 trips.

Number of visitors (largest event): 150 / 2.8 visitors per vehicle x 2 one-way trips = 107 trips.

Number of special event truck trips (largest event): 2 x 2 one-way trips = 4 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).

Cakebread Cellars

Existing Conditions Winery Traffic Information / Trip Generation Sheet

Maximum Daily Weekday Traffic (non-harvest season)

Total number of FT employees: 64 x 3.05 one-way trips per employee = 195 daily trips.

Total number of PT employees: 13 x 1.90 one-way trips per employee = 25 daily trips.

Anticipated weekday visitors: 450 / 2.6 visitors per vehicle x 2 one-way trips = 346 daily trips.

Gallons of production: 501,486 / 1,000 x .009 truck trips daily[3] x 2 one-way trips = 9 daily trips.

Total = 575 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38) = 205 **PM peak trips.**

Maximum Daily Weekend Traffic (non-harvest Saturday)

Number of FT employees (on Saturdays): 64 x 3.05 one-way trips per employee = 195 daily trips.

Number of PT employees (on Saturdays): 13 x 1.90 one-way trips per employee = 25 daily trips.

Anticipated Saturday visitors: 450 / 2.8 visitors per vehicle x 2 one-way trips = 321 daily trips.

Total = 541 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57) = 253 **PM peak trips.**

Maximum Daily Weekend Traffic – Saturday Harvest Season

Number of FT employees (during crush): 64 x 3.05 one-way trips per employee = 195 daily trips.

Number of PT employees (during crush): 13 x 1.90 one-way trips per employee = 25 daily trips.

Anticipated Saturday visitors: 450 / 2.8 visitors per vehicle x 2 one-way trips = 321 daily trips.

Gallons of production: 501,489 / 1,000 x .009 truck trips daily x 2 one-way trips = 9 daily trips.

Avg. annual tons of grape on-haul: 3057 / 144 truck trips daily[4] x 2 one-way trips = 42 daily trips.

Total = 592 **daily trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): 62 x 2 one-way trips per staff person = 124 trips.

Number of visitors (largest event): 858 / 2.8 visitors per vehicle x 2 one-way trips = 612 trips.

Number of special event truck trips (largest event): 7 x 2 one-way trips = 14 trips.

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[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).

Cakebread Cellars

Proposed Project Winery Traffic Information / Trip Generation Sheet

Maximum Daily Weekday Traffic (non-harvest season)

Total number of FT employees: 92 x 3.05 one-way trips per employee = 281 daily trips.

Total number of PT employees: 16 x 1.90 one-way trips per employee = 30 daily trips.

Anticipated weekday visitors: 450 / 2.6 visitors per vehicle x 2 one-way trips = 346 daily trips.

Gallons of production: 800,000 / 1,000 x .009 truck trips daily[3] x 2 one-way trips = 14 daily trips.

Total = 671 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38) = 237 **PM peak trips.**

Maximum Daily Weekend Traffic (non-harvest Saturday)

Number of FT employees (on Saturdays): 64 x 3.05 one-way trips per employee = 195 daily trips.

Number of PT employees (on Saturdays): 17 x 1.90 one-way trips per employee = 32 daily trips.

Anticipated Saturday visitors: 450 / 2.8 visitors per vehicle x 2 one-way trips = 346 daily trips.

Total = 573 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57) = 270 **PM peak trips.**

Maximum Daily Weekend Traffic – Saturday Harvest Season

Number of FT employees (during crush): 69 x 3.05 one-way trips per employee = 180 daily trips.

Number of PT employees (during crush): 51 x 1.90 one-way trips per employee = 97 daily trips.

Anticipated Saturday visitors: 450 / 2.8 visitors per vehicle x 2 one-way trips = 321 daily trips.

Gallons of production: 800,000 / 1,000 x .009 truck trips daily x 2 one-way trips = 14 daily trips.

Avg. annual tons of grape on-haul: 4571 / 144 truck trips daily[4] x 2 one-way trips = 63 daily trips.

Total = 675 **daily trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): 62 x 2 one-way trips per staff person = 124 trips.

Number of visitors (largest event): 858 / 2.8 visitors per vehicle x 2 one-way trips = 613 trips.

Number of special event truck trips (largest event): 7 x 2 one-way trips = 14 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

Proposed Project Winery Traffic Information / Trip Generation Sheet

Maximum Daily Weekday Traffic (non-harvest season)

Total number of FT employees: 16 x 3.05 one-way trips per employee	=	49	daily trips.
Total number of PT employees: 4 x 1.90 one-way trips per employee	=	8	daily trips.
Anticipated weekday visitors: 32 / 2.6 visitors per vehicle X 2 one-way trips	=	24	daily trips.
Gallons of production: 70,000 1,000 x .009 truck trips daily[3] x 2 one-way trips	=	2	daily trips.
Total	=	166	**daily trips.**
(No of FT Employees) + (No of PT employees/2) + (sum of visitor and truck trips X .38)	=	63	**PM peak trips.**

Maximum Daily Weekend Traffic (non-harvest Saturday)

Number of FT employees (on Saturdays): 16 x 3.05 one-way trips per employee	=	49	daily trips.
Number of PT employees (on Saturdays): 2 x 1.90 one-way trips per employee	=	4	daily trips.
Anticipated Saturday visitors: 32 / 2.8 visitors per vehicle x 2 one-way trips	=	23	daily trips.
Total	=	76	**daily trips.**
(No of FT employees) + (No of PT employees/2) + (visitor trips X .57)	=	43	**PM peak trips.**

Maximum Daily Weekend Traffic – Saturday Harvest Season

Number of FT employees (during crush): 16 x 3.05 one-way trips per employee	=	49	daily trips.
Number of PT employees (during crush): 4 x 1.90 one-way trips per employee	=	8	daily trips.
Anticipated Saturday visitors: 32 / 2.8 visitors per vehicle x 2 one-say trips	=	22	daily trips.
Gallons of production: 70,000 / 1,000 x .009 truck trips daily x 2 one-way trips	=	1	daily trips.
Avg. annual tons of grape on-haul: 67,456 / 144 truck trips daily [4] x 2 one-way trips	=	8	daily trips
Total	=	88	**daily trips.**

Largest Marketing Event – Additional Traffic

Number of event staff (largest event): 10 x 2 one-way trips per staff person	=	20	trips.
Number of visitors (largest event): 125 / 2.8 visitors per vehicle x 2 one-way trips	=	89	trips.
Number of special event truck trips (largest event): 10 x 2 one-way trips	=	20	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]Assume 4 tons per trip / 36 crush days per year (see *Traffic Information Sheet Addendum* for reference).

Provenance Winery

See traffic study scope prepared by Crane Transportation Group.

Winery Traffic Information / Trip Generation Sheet

Traffic during a Typical Weekday

Number of FT employees: 11 x 3.05 one-way trips per employee = 34 daily trips.

Number of PT employees: 5 x 1.90 one-way trips per employee = 10 daily trips.

Average number of weekday visitors: 10 / 2.6 visitors per vehicle x 2 one-way trips = 4 daily trips.

Gallons of production: no change / 1,000 x .009 truck trips daily[3] x 2 one-way trips = _____ daily trips.

Total = 48 **daily trips.**

Number of total weekday trips x .38 = 18 **PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays): 11 x 3.05 one-way trips per employee = 34 daily trips.

Number of PT employees (on Saturdays): 5 x 1.90 one-way trips per employee = 10 daily trips.

Average number of weekend visitors: 10 / 2.8 visitors per vehicle x 2 one-way trips = 7 daily trips.

Total = 51 **daily trips.**

Number of total Saturday trips x .57 = 29 **PM peak trips.**

Traffic during a Crush Saturday

Number of FT employees (during crush): 11 x 3.05 one-way trips per employee = 34 daily trips.

Number of PT employees (during crush): 5 x 1.90 one-way trips per employee = 10 daily trips.

Average number of weekend visitors: 5 / 2.8 visitors per vehicle x 2 one-way trips = 4 daily trips.

Gallons of production: no change / 1,000 x .009 truck trips daily x 2 one-way trips = _____ daily trips.

Avg. annual tons of grape on-haul: no change x .11 truck trips daily[4] x 2 one-way trips = _____ daily trips.

Total = _____ **daily trips.**

Number of total Saturday trips x .57 = _____ **PM peak trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): 18 x 2 one-way trips per staff person = 36 trips.

Number of visitors (largest event): 250 / 2.8 visitors per vehicle x 2 one-way trips = 178 trips.

Number of special event truck trips (largest event): 2 x 2 one-way trips = 4 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).

STAGLIN

Existing Conditions Winery Traffic Information / Trip Generation

Determine Winery Daily Trips. Complete Sections A through H below to determine your winery project's estimated baseline daily and peak hour trips.

Section A. Maximum Daily Weekday Traffic (Friday, non-harvest season)

1. Total number of FT employees[1]: 8 x 3.05 one-way trips per employee = 24.4 daily trips
2. Total number of PT employees[1]: 0 x 1.90 one-way trips per employee = 0 daily trips
3. Maximum weekday visitors[1]: 10 /2.6 visitors per vehicle x 2 one-way trips = 7.7 daily trips
4. Gallons of production: 36000 /1,000 x 0.009 daily truck trips[2] x 2 one-way trips = 0.6 daily trips
5. TOTAL = 32.7 (33) daily trips

Section B. Maximum Daily Weekday Traffic (Friday, harvest season)

6. Total number of FT employees[1]: 8 x 3.05 one-way trips per employee = 24.4 daily trips
7. Total number of PT employees[1]: 0 x 1.90 one-way trips per employee = 0 daily trips
8. Maximum weekday visitors[1]: 10 /2.6 visitors per vehicle x 2 one-way trips = 7.7 daily trips
9. Gallons of production: 36000 /1,000 x 0.009 daily truck trips x 2 one-way trips = 0.6 daily trips
10. Avg. annual tons of grape on-haul: 69 / 144 truck trips x 2 one-way trips = 1.0 daily trips
11. TOTAL = 33.7 (34) daily trips

Section C. Maximum Daily Weekend Traffic (Saturday, non-harvest season)

12. Total number of FT Sat. employees[1]: 0 x 3.05 one-way trips per employee = 0 daily trips
13. Total number of PT Sat. employees[1]: 0 x 1.90 one-way trips per employee = 0 daily trips
14. Maximum Saturday visitors[1]: 0 /2.8 visitors per vehicle x 2 one-way trips = 0 daily trips
15. TOTAL = 0 daily trips

Section D. Maximum Daily Weekend Traffic (Saturday, harvest season)

16. Total number of FT Sat. employees[1]: 5 x 3.05 one-way trips per employee = 15.3 daily trips
17. Total number of PT Sat. employees[1]: 0 x 1.90 one-way trips per employee = 0 daily trips
18. Maximum Saturday visitors[1]: 0 /2.8 visitors per vehicle x 2 one-way trips = 0 daily trips
19. Gallons of production: 36000 /1,000 x 0.009 daily truck trips x 2 one-way trips = 0.6 daily trips
20. Avg. annual tons of grape on-haul: 69 / 144 truck trips x 2 one-way trips = 1.0 daily trips
21. TOTAL = 16.9 daily trips

Existing Conditions Winery Traffic Information / Trip Generation

Section E. PM Peak Hour Trip Generation (Friday, non-harvest season)

(Sum of daily trips from Sec. A, lines 3 and 4) x 0.38 + (No. of FTE) + (No. of PTE / 2) = 7.0 PM peak trips

Section F. PM Peak Hour Trip Generation (Friday, harvest season)

(Sum of daily trips, Sec. B, lines 8, 9, 10) x 0.38 + (No. of FTE) + (No. of PTE / 2) = 7.5 (8) PM peak trips

Section G. PM Peak Hour Trip Generation (Saturday, non-harvest season)

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[1] The number of weekday visitors shall include guests of the largest of any event that is proposed to occur two or more times in a month, on average. Full-time and part-time employees that staff such events shall also be included in the employee numbers.

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

(Daily trips from Sec. C, line 14) x 0.57 + (No. of FTE) + (No. of PTE / 2) = **0.0** PM peak trips

Section H. PM Peak Hour Trip Generation (Saturday, harvest season)

(Sum of daily trips Sec. D, lines 18, 19, 20) x 0.57 + (No. of FTE) + (No. of PTE / 2) = **3.4 (4)** PM peak trips

Section I. Estimated Annual Trips

(Sec. A, line 5 x 206) + (Sec. B, line 11 x 55) + (Sec. C, line a5 x 82) + (Sec. D, line 21 x 22) = **8,685** Annual trips

Appendix E

Trip Generation Forms

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Existing Conditions Winery Traffic Information / Trip Generation

Determine Winery Daily Trips. ***Complete Sections A through I below to determine your winery project's estimated baseline daily and peak hour trips.***

Project Name: Sullivan Rutherford Estate Winery **Project Scenario: Existing**

Section A. Maximum Daily Weekday Traffic (Friday, non-harvest season)

1.	Total number of FT employees:	12	x 3.05 one-way trips per employee	=	36.6	daily trips
2.	Total number of PT employees:	1	x 1.90 one-way trips per employee	=	1.9	daily trips
3.	Maximum weekday visitors:	10	/2.6 visitors per vehicle x 2 one-way trips	=	7.7	daily trips
4.	Gallons of production:	22500	/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	0.4	daily trips
5.			TOTAL	=	47	daily trips

Section B. Maximum Daily Weekday Traffic (Friday, harvest season)

6.	Total number of FT employees:	12	x 3.05 one-way trips per employee	=	36.6	daily trips
7.	Total number of PT employees:	2	x 1.90 one-way trips per employee	=	3.8	daily trips
8.	Maximum weekday visitors:	15	/2.6 visitors per vehicle x 2 one-way trips	=	11.5	daily trips
9.	Gallons of production:	10000	/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	0.2	daily trips
10.	Avg. annual tons of grape on-haul:	20	/ 144 truck trips x 2 one-way trips	=	0.3	daily trips
11.			TOTAL	=	52	daily trips

Section C. Maximum Daily Weekend Traffic (Saturday, non-harvest season)

12.	Total number of FT Sat. employees:	3	x 3.05 one-way trips per employee	=	9.2	daily trips
13.	Total number of PT Sat. employees:	0	x 1.90 one-way trips per employee	=	0.0	daily trips
14.	Maximum Saturday visitors:	15	/2.8 visitors per vehicle x 2 one-way trips	=	10.7	daily trips
15.	Gallons of Production:	22500	/1,000 x 0.009 daily truck trips x 2 one-way trips	=	0	daily trips
16.			TOTAL	=	20	daily trips

Section D. Maximum Daily Weekend Traffic (Saturday, harvest season)

17.	Total number of FT Sat. employees:	5	x 3.05 one-way trips per employee	=	15.3	daily trips
18.	Total number of PT Sat. employees:	2	x 1.90 one-way trips per employee	=	3.8	daily trips
19.	Maximum Saturday visitors:	18	/2.8 visitors per vehicle x 2 one-way trips	=	12.9	daily trips
20.	Gallons of production:	10000	/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	0.2	daily trips
21.	Avg. annual tons of grape on-haul:	20	/ 144 truck trips x 2 one-way trips	=	0.3	daily trips
22.			TOTAL	=	33	daily trips

Section E. PM Peak Hour Trip Generation (Friday, non-harvest season)

(Sum of daily trips from Sec. A, lines 3 and 4) x 0.18 + (No. of FTE) + (line 2 / 2) = 14 PM peak trips

Section F. PM Peak Hour Trip Generation (Friday, harvest season)

(Sum of daily trips, Sec. B, lines 8, 9, 10) x 0.18 + (No. of FTE) + (line 7 / 2) = 15 PM peak trips

Section G. PM Peak Hour Trip Generation (Saturday, non-harvest season)

(Daily trips from Sec. C, line 14 and 15) x 0.31 + (No. of FTE) + (line 13 / 2) = 6 PM peak trips

Section H. PM Peak Hour Trip Generation (Saturday, harvest season)

(Sum of daily trips Sec. D, lines 19, 20, 21) x 0.31 + (No. of FTE) + (line 18 / 2) = 10 PM peak trips

Section I. Maximum Annual Trips

(Sec. A, line 5 x 206) + (Sec. B, line 11 x 55) + (Sec. C, line 16 x 82) + (Sec. D, line 22 x 22) = 14908 Annual trips

Proposed Project Winery Traffic Information / Trip Generation

Determine Winery Daily Trips. ***Complete Sections J through R below to determine your winery project's estimated future and peak hour trips.***

Project Name: Sullivan Rutherford Estate Winery **Project Scenario: Proposed**

Section J. Maximum Daily Weekday Traffic (Friday, non-harvest season)

1.	Total number of FT employees:	20	x 3.05 one-way trips per employee	=	61.0	daily trips
2.	Total number of PT employees:	0	x 1.90 one-way trips per employee	=	0.0	daily trips
3.	Maximum weekday visitors:	45	/2.6 visitors per vehicle x 2 one-way trips	=	34.6	daily trips
4.	Gallons of production:	33000	/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	0.6	daily trips
5.			TOTAL	=	96	daily trips

Section K. Maximum Daily Weekday Traffic (Friday, harvest season)

6.	Total number of FT employees:	20	x 3.05 one-way trips per employee	=	61.0	daily trips
7.	Total number of PT employees:	0	x 1.90 one-way trips per employee	=	0.0	daily trips
8.	Maximum weekday visitors:	45	/2.6 visitors per vehicle x 2 one-way trips	=	34.6	daily trips
9.	Gallons of production:	33000	/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	0.6	daily trips
10.	Avg. annual tons of grape on-haul:	58	/ 144 truck trips x 2 one-way trips	=	0.8	daily trips
11.			TOTAL	=	97	daily trips

Section L. Maximum Daily Weekend Traffic (Saturday, non-harvest season)

12.	Total number of FT Sat. employees:	4	x 3.05 one-way trips per employee	=	12.2	daily trips
13.	Total number of PT Sat. employees:	0	x 1.90 one-way trips per employee	=	0.0	daily trips
14.	Maximum Saturday visitors:	45	/2.8 visitors per vehicle x 2 one-way trips	=	32.1	daily trips
15.	Gallons of Production:	33000	/1,000 x 0.009 daily truck trips x 2 one-way trips	=	0.6	daily trips
16.			TOTAL	=	45	daily trips

Section M. Maximum Daily Weekend Traffic (Saturday, harvest season)

17.	Total number of FT Sat. employees:	7	x 3.05 one-way trips per employee	=	21.4	daily trips
18.	Total number of PT Sat. employees:	0	x 1.90 one-way trips per employee	=	0.0	daily trips
19.	Maximum Saturday visitors:	45	/2.8 visitors per vehicle x 2 one-way trips	=	32.1	daily trips
20.	Gallons of production:	33000	/1,000 x 0.009 daily truck trips2 x 2 one-way trips	=	0.6	daily trips
21.	Avg. annual tons of grape on-haul:	58	/ 144 truck trips x 2 one-way trips	=	0.8	daily trips
22.			TOTAL	=	55	daily trips

Section N. PM Peak Hour Trip Generation (Friday, non-harvest season)

(Sum of daily trips from Sec. J, lines 3 and 4) x 0.18 + (No. of FTE) + (line 2 / 2) = 26 PM peak trips

Section O. PM Peak Hour Trip Generation (Friday, harvest season)

(Sum of daily trips, Sec. K, lines 8, 9, 10) x 0.18 + (No. of FTE) + (line 7 / 2) = 26 PM peak trips

Section P. PM Peak Hour Trip Generation (Saturday, non-harvest season)

(Daily trips from Sec. L, line 14 and 15) x 0.31 + (No. of FTE) + (line 13 / 2) = 14 PM peak trips

Section Q. PM Peak Hour Trip Generation (Saturday, harvest season)

(Sum of daily trips Sec. M, lines 19, 20, 21) x 0.31 + (No. of FTE) + (line 18 / 2) = 17 PM peak trips

Section R. Maximum Annual Trips

(Sec. J, line 5 x 206) + (Sec. K, line 11 x 55) + (Sec. L, line 16 x 82) + (Sec. M, line 22 x 22) = 30011 Annual trips

Appendix F

Left Turn Lane Warrant

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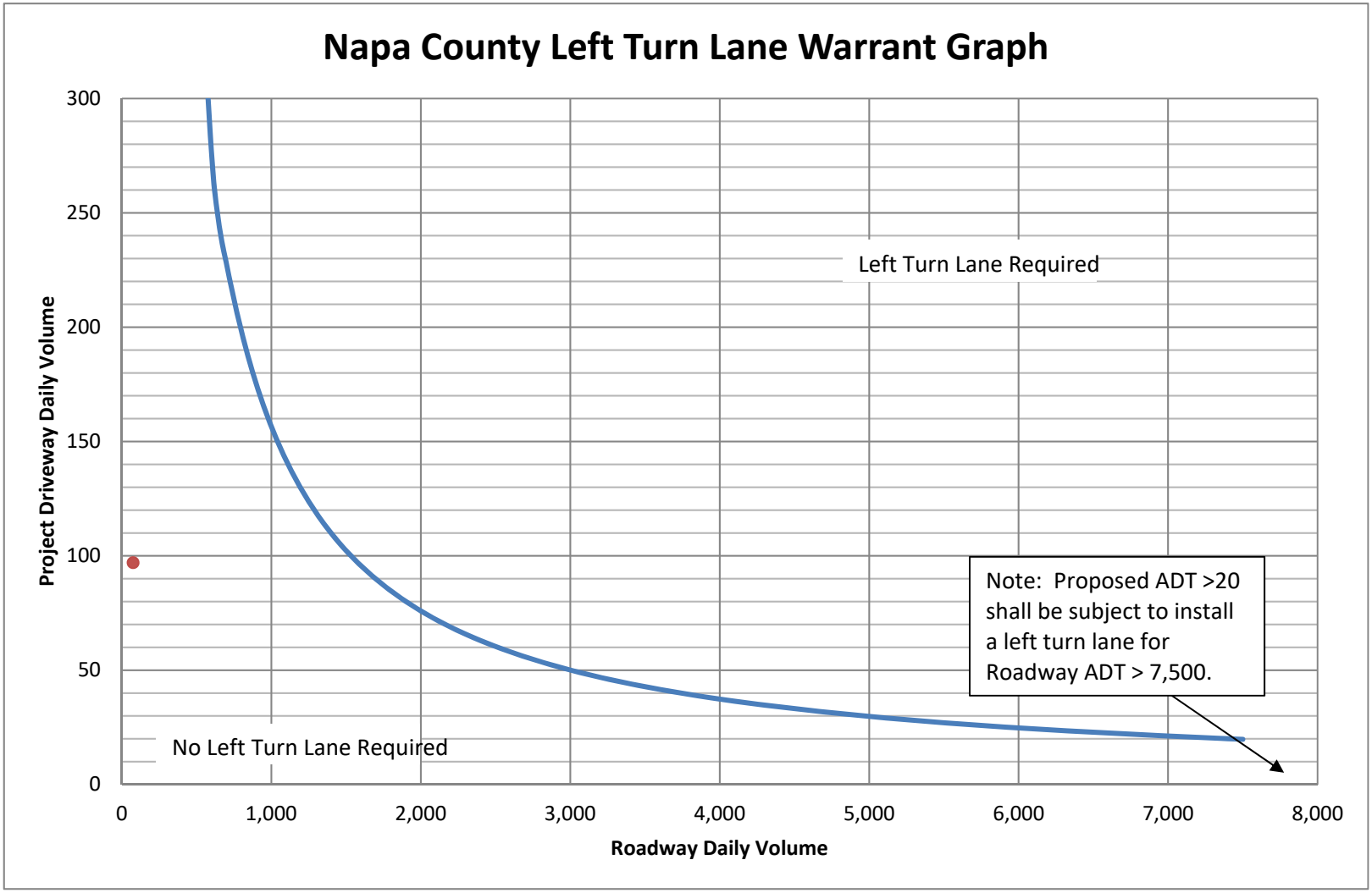
Napa County Left Turn Lane Warrant Graph
Project Driveway Daily Volume
300
250
200
150
100
50
0
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
Roadway Daily Volume
Left Turn Lane Required
No Left Turn Lane Required
Note: Proposed ADT >20 shall be subject to install a left turn lane for Roadway ADT > 7,500.