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Traffic Study

Amended Caymus Winery Traffic Impact Study

Prepared for the

County of Napa

Submitted by

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Balancing Functionality and Livability
Traffic Engineering • Transportation Planning

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Executive Summary

The project site, which is currently being used as a winery, is located at 8700 Conn Creek Road in the community of Rutherford, Napa County. The proposed project would increase the full-time and part-time employees, and wine production as compared to permitted conditions. An increase in visitors from existing conditions to proposed conditions was also assumed even though the winery's current permit does not set a limitation on the number of visitors allowed.

Vehicular access to the project site is proposed via two driveways, with the north driveway located on SR 128 and the south driveway located on Conn Creek Road. The existing south driveway would provide access to inbound staff and trucks. The north driveway will provide access to inbound and outbound visitors as well as outbound staff and truck traffic.

The project is anticipated to generate 45 additional trips during the weekday p.m. peak hour and 122 additional trips during the weekend midday peak hour as compared to existing conditions. Throughout this report, the terms "permitted use" and "permitted conditions" as applied to visitor numbers refer to the anticipated number of visitors reported in the 1988 use permit application. The project is anticipated to generate 130 additional trips during the weekday p.m. peak hour and 210 additional trips during the weekend midday peak hour as compared to permitted conditions.

The study area includes the SR 128/Conn Creek Road intersection; however due to its unusual configuration it was analyzed as three separate intersections for traffic analysis purposes. The SR 128/ Conn Creek Road study intersection operates acceptably under Existing Conditions and is expected to continue to do so with the addition of project-generated traffic. Under Cumulative and Future Conditions, SR 128/Conn Creek Road is anticipated to operate acceptably without and with the addition of project-generated traffic.

SR 29/SR 128 is currently operating unacceptably and qualifies for signalization based on the *California Manual on Uniform Traffic Control Devices* (CA-MUTCD) peak hour signal warrant criteria. Under Cumulative conditions, which take into consideration all currently proposed projects (including the proposed project) and approved yet un-built projects, delay is expected to increase, resulting in a continued LOS F operation during the weekend peak hour on the eastbound and westbound approach. Signalization of the intersection with second through lanes in both directions on SR 29 would achieve acceptable operation under long-term conditions. In keeping with General Plan Policy AG-LU 98 as well as Action Item CIR 19.1, the County should identify proposed intersection improvements and impose a traffic impact fee program. Currently the County is in the process of studying improvements needed to meet their operational standards. It is therefore recommended that the applicant pay a fee equal to the project's proportional share of the cost of signalization or comparable alternative. With the improvements needed to accommodate anticipated future demand, the intersection is expected to operate acceptably without and with project traffic added. It is further suggested that the project applicant reduce dependence on single vehicle occupancy through a demand management program.

SR 128/Silverado Trail South is operating acceptably overall on weekdays, and is expected to continue doing so upon adding project-generated traffic though the eastbound and westbound approaches, which currently operate at LOS F during the weekday p.m. peak hour, would continue to do so. A traffic signal is needed to accommodate future volumes even without the project, and this improvement should be included in the County's traffic impact fee. The applicant should pay either the traffic impact fee or a proportional share towards this future project.

The calculated collision rate for the study segment on SR 128 near the project vicinity was determined to be slightly higher than the statewide average for similar facilities. One fatal collision was reported

during the five-year study period that involved an intoxicated driver. The predominant type of collision was single vehicles running off the road.

In order to enhance safety and access, it is recommended that the applicant construct a landscaped median at SR 128/Conn Creek Road, with either curbs or asphalt berms, restrict turning movements from the northbound Conn Creek Road approaches and install way-finding signage.

The proposed project would not disrupt the existing or planned bicycle facilities. Improvements at SR 128/ Conn Creek Road should include connecting the existing Class II bike lane on the east side of Conn Creek Road along the project frontage to where it intersects with SR 128. The frontage improvements on SR 128 should provide adequate width to accommodate a Class II bike lane in the future.

Sight distances at the proposed north driveway on SR 128 as well as the existing south driveway on Conn Creek Road are adequate. Proposed internal circulation for passenger vehicles would be adequate.

A left-turn lane is not warranted at the southern project driveway per the County of Napa's criteria or at the northern project driveway per Caltrans criteria. Therefore, installation of left-turn lanes at the project driveways is not recommended. The applicant is requesting an "exception to standards" related to the Napa County warrant in lieu of a right-turn taper, which is warranted under future plus project weekend volumes, and should be constructed on SR 128 at the north project driveway.

To minimize traffic impacts associated with the proposed project it is recommended that the applicant develop a transportation demand management (TDM) program that encourages activities such as carpooling, shifting work hours and scheduled appointments to move trips out of peak periods, and other measures that are feasible for a winery operation.

Introduction

This report presents an analysis of the potential traffic impacts that would be associated with the proposed expansion of the Caymus Vineyards located on the east side of Conn Creek Road at State Route (SR) 128 near the community of Rutherford in Napa County. The traffic study was completed in accordance with the criteria established by Napa County and is consistent with standard traffic engineering techniques. Comments provided by County staff on draft reports dated October 31, 2013, October 3, 2014, December 23, 2014, and January 16, 2015 were addressed and changes incorporated as requested in preparing this final report, including submittal of a proposed scope for this analysis to the project planner on March 27, 2015.

Prelude

The purpose of a traffic impact study is to provide the Napa County staff and policy makers with data that 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 in order to mitigate these impacts to a level of insignificance as defined by the Napa 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 bicyclists are also addressed.

Project Profile

The project as proposed includes the expansion of an existing winery located at 8700 Conn Creek Road in Rutherford, Napa County. As compared to permitted conditions, the proposed project would increase production as well as the number of full-time and part-time employees. As compared to existing conditions, the proposed project would increase the number of employees, but decrease the amount of wine produced. The winery is currently permitted for 450 tasting room visitors, and an additional 400 visitors are proposed. Access to the site is proposed for visitors and outbound staff and trucks via a driveway on SR 128, north of its intersection with Rutherford Road. The existing south driveway, located on Conn Creek Road south of its intersection with Rutherford Road, will continue to be used for inbound employees and deliveries.

Operational Analysis

Study Area and Periods

The study area consists of the SR 128/Conn Creek Road intersection as well as SR 128/SR 29 and SR 128-Conn Creek Road/Silverado Trail. Due to the unusual configuration of SR 128/Conn Creek Road, it was analyzed as three intersections as follows:

1. SR 128/Conn Creek Road (north)
2. SR 128/Conn Creek Road (south)
3. SR 128/Conn Creek Road (west)
4. SR 128/SR 29
5. SR 128-Conn Creek Road/Silverado Trail South

Operating conditions during the weekday p.m. and weekend midday peak periods were evaluated as these time periods reflect the highest traffic volumes areawide and for the proposed project. The evening 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 12:00 noon and 2:00 p.m.

Study Intersections

SR 128/Conn Creek Road (north) is an unsignalized tee intersection with the SR 128 southbound and eastbound approaches being free and the northbound Conn Creek Road being stop controlled.

SR 128/Conn Creek Road (south) is an unsignalized tee intersection with the Conn Creek Road southbound approach being stop controlled and the SR 128 eastbound and Conn Creek Road northbound approaches being free.

SR 128/Conn Creek Road (west) is an unsignalized tee intersection with the SR 128 eastbound and southbound approaches being free and the Conn Creek Road northbound approach being stop controlled.

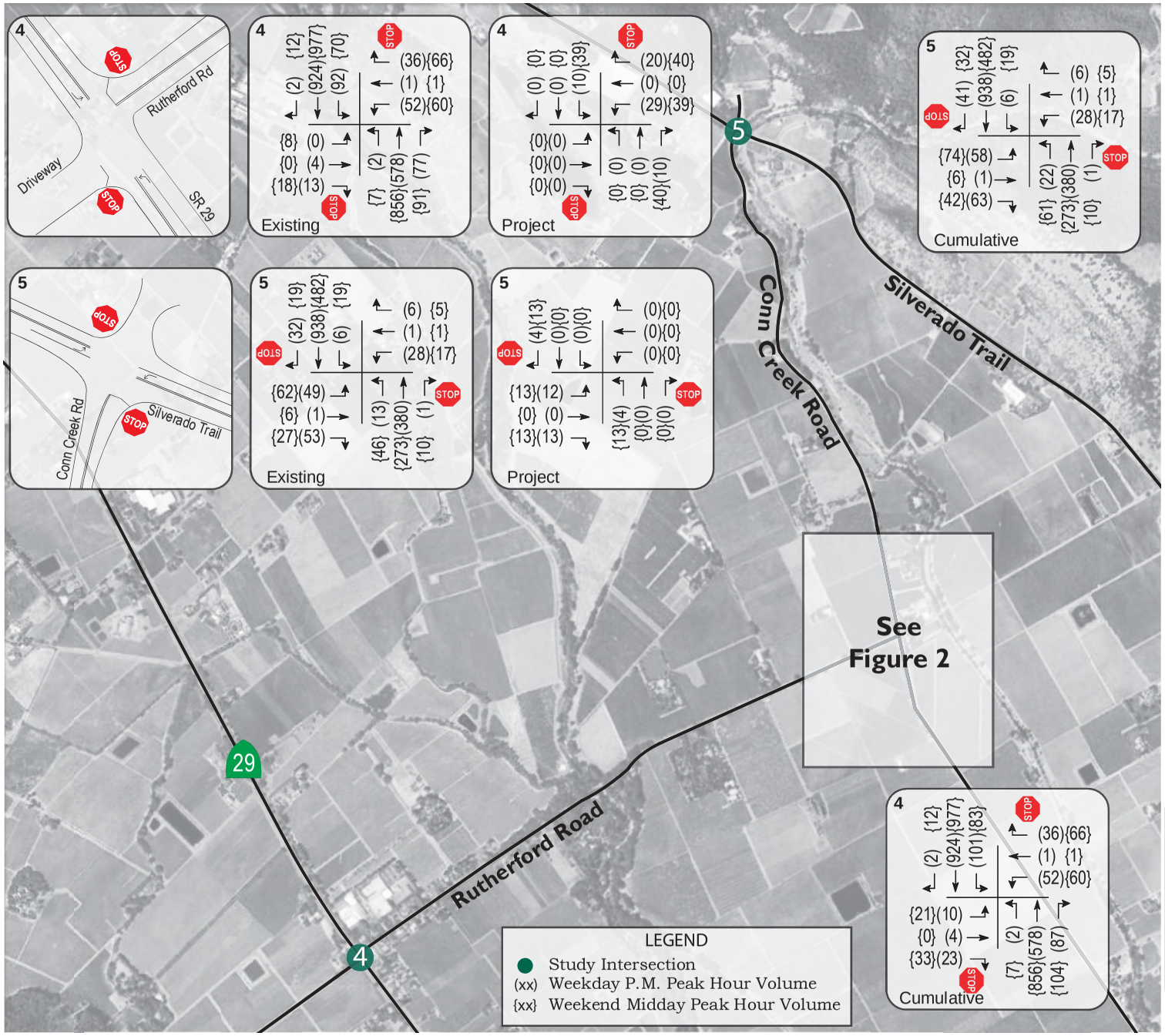
SR 128/SR 29 is an unsignalized four-legged offset intersection with the eastbound and westbound legs stop-controlled while the SR 29 approaches are free.

SR 128-Conn Creek Road/Silverado Trail South is a four-legged intersection with stop-controlled eastbound and westbound Conn Creek Road approaches while the Silverado Trail approaches are free. The westbound approach is a driveway that provides access to Rutherford Ranch.

The locations of the study intersections and the existing lane configurations and controls are shown in Figures 1 and 2.

Collision History

The collision history along SR 128 in the vicinity of the project site was reviewed to determine any trends or patterns that may indicate a safety issue. Collisions that occurred within one-half mile on either side of the project site during a five-year period between January 1, 2007, and December 31, 2011, were included in the analysis. Collision rates were calculated based on the collision data available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The calculated collision rate for the study segment was compared to the average



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Caymus Winery Traffic Impact Study

Figure 1 – Full Study Area, Lane Configurations, Existing and Project Traffic Volumes

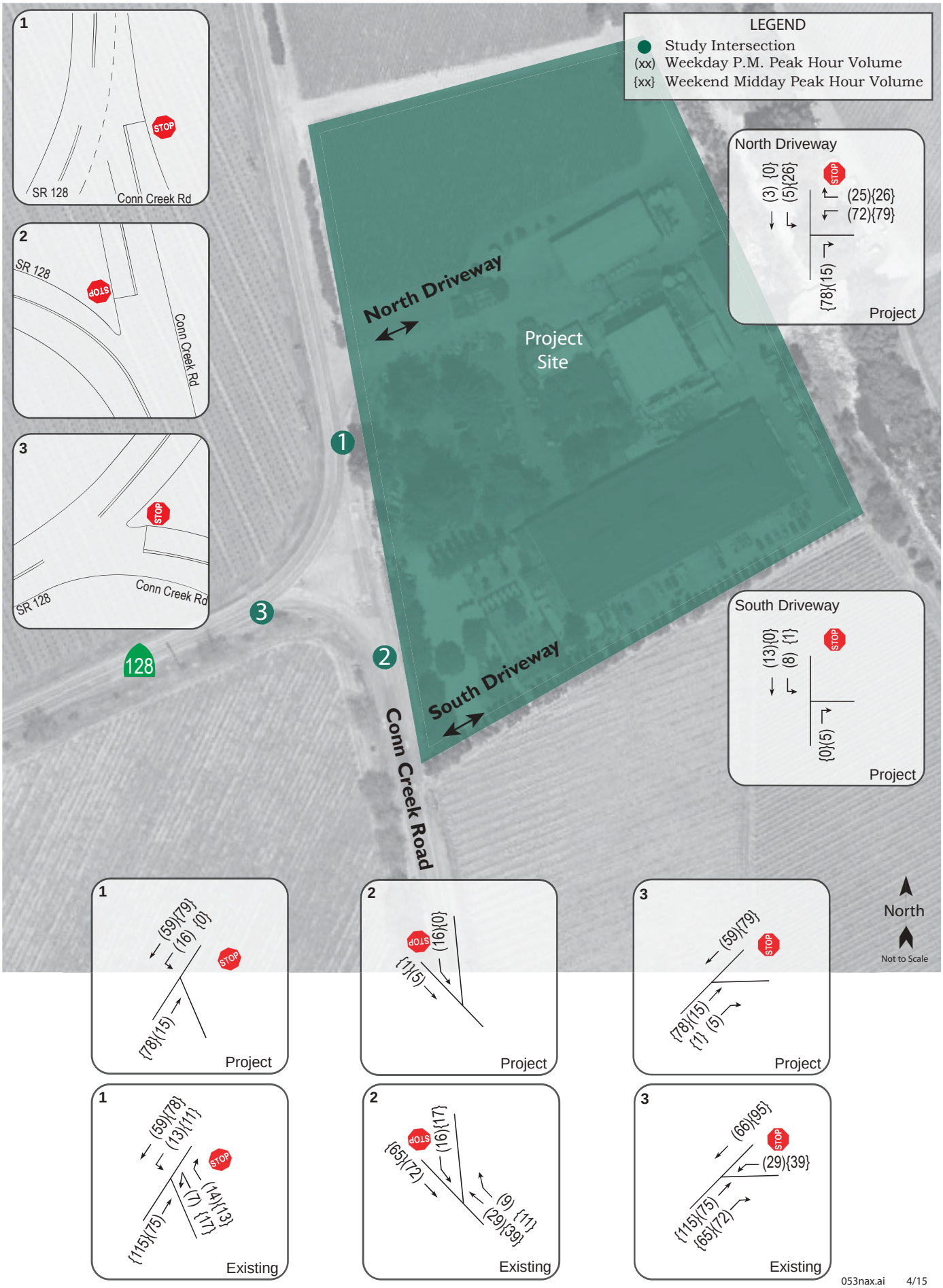

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Figure 2 – Lane Configurations, Existing and Project Traffic Volumes

collision rate for similar facilities statewide, as indicated in *2009 Accident Data on California State Highways*, California Department of Transportation (Caltrans).

Over the five-year study period, five collisions were reported for a calculated collision rate of 1.10 collisions per million vehicle miles (c/mvm). The average statewide collision rate for a two-lane rural roadway with a speed limit equal to or less than 55 mph is 1.09 c/mvm. It should be noted that the calculated collision rate was slightly higher than the statewide average for similar facilities. None of the collisions reported involved an injury; however, one fatality, which involved an intoxicated driver, was reported along this segment during the five-year period studied.

The collision data was further examined to determine any apparent trends in collision types. Of the five collisions reported along the segment, four collisions (including the fatal collision) were single-vehicle crashes involving a fixed object. The primary collision factor associated with single-vehicle crashes, again including the fatal crash, was "driving under influence." Additionally, a head-on collision was reported at the SR 128/Conn Creek Road intersection with "auto right-of way violation" being the primary collision factor. The collision rate calculations are provided in Appendix A.

Alternative Modes

Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2012, classifies bikeways into three 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.

In the project area, Class II bike lanes exist on both sides of Conn Creek Road south of the project driveways. Bicyclists ride in the roadway along SR 128 within the project study area. Per the *Napa County Bicycle Plan*, Napa County Transportation and Planning Agency, 2012, long range plans include providing Class II bike lanes on SR 128.

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 intersections were analyzed using methodologies published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2000. 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 Levels of Service for the study intersections, which all have side street stop controls, were analyzed using the "Two-Way Stop-Controlled" intersection capacity method from the HCM. This 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 1.

Table 1
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*, Transportation Research Board, 2000

Traffic Operation Standards

According to the *Napa County General Plan*, 2009, "No single level of service standard is appropriate for un-signalized intersections, which shall be evaluated on a case-by-case basis to determine if signal warrants are met." For analysis purposes it was assumed that the impact would be significant if project-added traffic caused operation to fall to LOS E or F on an approach for which the Peak Hour Volume Signal Warrant is met.

Policy CIR-13 in the General Plan states, "The County seeks to provide a roadway system that maintains current roadway capacities in most locations and is both safe and efficient in terms of providing local access."

Policy CIR-16 of the Napa County General Plan provides guidance for roadways, indicating that, "The County shall seek to maintain an arterial Level of Service D or better on all county roadways, except where maintaining this desired level of service would require the installation of more travel lanes than shown on the Circulation Map."

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the weekday p.m. and weekend midday p.m. peak periods. This condition does not include project-generated traffic volumes. Existing traffic volume counts were obtained in March 2015 for SR 128/SR 29 and SR 128/Silverado Trail South during the weekday evening peak hour and Saturday midday peak hour as shown in Figure 1 and during harvest in October 2012 for SR 128/Conn Creek Road, as shown in Figure 2.

Intersection Levels of Service

Under existing conditions, all of the study intersections operate at LOS A overall except SR128/SR 29 which operates unacceptably at LOS E during the weekend midday peak hour. The eastbound and westbound approaches at SR 128/SR 29 typically operate at LOS F during the peak hours, except that the westbound approach operates at LOS D during the weekday peak hour. The eastbound and westbound approaches of SR 128-Conn Creek Road to Silverado Trail operate at LOS F during the weekday peak hour and at LOS D or better during the weekend peak hour. A summary of the intersection level of service calculations is contained in Table 2, and copies of the Level of Service calculations are provided in Appendix B.

Table 2
Existing Peak Hour Intersection Levels of Service

Study Intersection ***Approach***	**Existing Conditions**			
	Weekday PM Peak		**Weekend MD Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. SR 128/Conn Creek Rd (north)	1.7	A	1.6	A
Conn Creek Rd (northbound)	*9.1*	*A*	*9.6*	*A*
2. SR 128/Conn Creek Rd (south)	1.2	A	1.2	A
Conn Creek Rd (southbound)	*9.2*	*A*	*9.2*	*A*
3. SR 128/Conn Creek Rd (west)	1.2	A	1.3	A
Conn Creek Rd (westbound)	*9.8*	*A*	*10.3*	*B*
4. SR 128/SR 29	14.3	B	**42.0**	**E**
Eastbound Approach	*29.7*	*D*	*85.3*	*F*
Westbound Approach	**	*F*	**	*F*
With recommended improvements	8.3	A	9.6	A
5. SR 128-Conn Creek Rd/Silverado Trail S	7.0	A	3.6	A
Eastbound Approach	*77.0*	*F*	*26.0*	*D*
Westbound Approach	*70.2*	*F*	*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*; ** Delay greater than 120 seconds; **Bold** text indicates deficient operation; Shaded cells = operation with improvements

Finding: The intersection of SR 128/SR 29 currently operates at an unacceptable LOS E during the weekend midday peak hour. The County of Napa has expressed in its General Plan that widening of the highway is not encouraged, though Policy AG/LU-98 identifies the need for improvements at the intersection (called Highway 29 and Rutherford Cross Road in the General Plan) to improve safety and accessibility. Further, it has been determined that roundabouts are infeasible where SR 29 is paralleled closely by the Wine Train tracks, as is the case at SR 128/SR 29.

Recommendation: The County should include improvements to SR 128/SR 29, as called for in the General Plan, in the traffic impact fee structure that is currently being developed in accord with Action Item CIR-19.1.

Roadways

Information in the *Napa County General Plan Update Environmental Impact Report*, 2008 (GPUFEIR), indicates that under 2003 volumes SR 29 was operating at LOS F between Rutherford Road and Oakville Cross Road (this is the nearest segment included in the analysis). Silverado Trail between Sage Canyon Road and Yountville Cross Road is identified in the same document as operating at LOS C under 2003 volumes. Both SR 29 and Silverado Trail are shown as two-lane Rural Throughways on the Circulation Map (Figure CIR-1).

Cumulative Conditions

Cumulative operating conditions were determined with traffic for other approved projects in the same vicinity added to existing volumes. As directed by County staff, the following projects were included to evaluate Cumulative Conditions.

- *Frog's Leap Winery* – revised use permit with 240,000 gallons of production annually; 30 full-time and five part-time employees on weekdays, 10 full-time and five part-time employees on weekends; 125 visitors on weekdays, 300 visitors on weekends; two trucks per day on weekdays and weekends

- *Frank's Family Vineyards Winery* – use permit update with 475,00 gallons of production annually, 14 full-time employees, 5 part-time employees and 50 visitors per day

Project volumes for Frog's Leap were taken from the *Revised Focused Traffic Analysis for the Proposed Frog's Leap Winery Modifications Project, December 15, 2014* by Omni-Means and were calculated for Frank's Family Vineyards Winery using the County's trip generation form. These volumes were added to volumes for Existing Conditions to achieve Cumulative Conditions volumes.

Under Cumulative Conditions the study intersections, with the exception of SR 128/SR 29, are expected to continue to operate acceptably at LOS A or B overall during both peak hours. At SR 128/SR 29, the eastbound and westbound approaches are expected to operate at LOS F during all peak hours. The eastbound and westbound approaches at SR 128-Conn Creek Road/Silverado Trail South are expected to operate at LOS F during the weekday peak hour and at LOS D or better during the weekend peak hour. The Cumulative volumes are shown in Figures 1 and 3, and the resulting levels of service are summarized in Table 3.

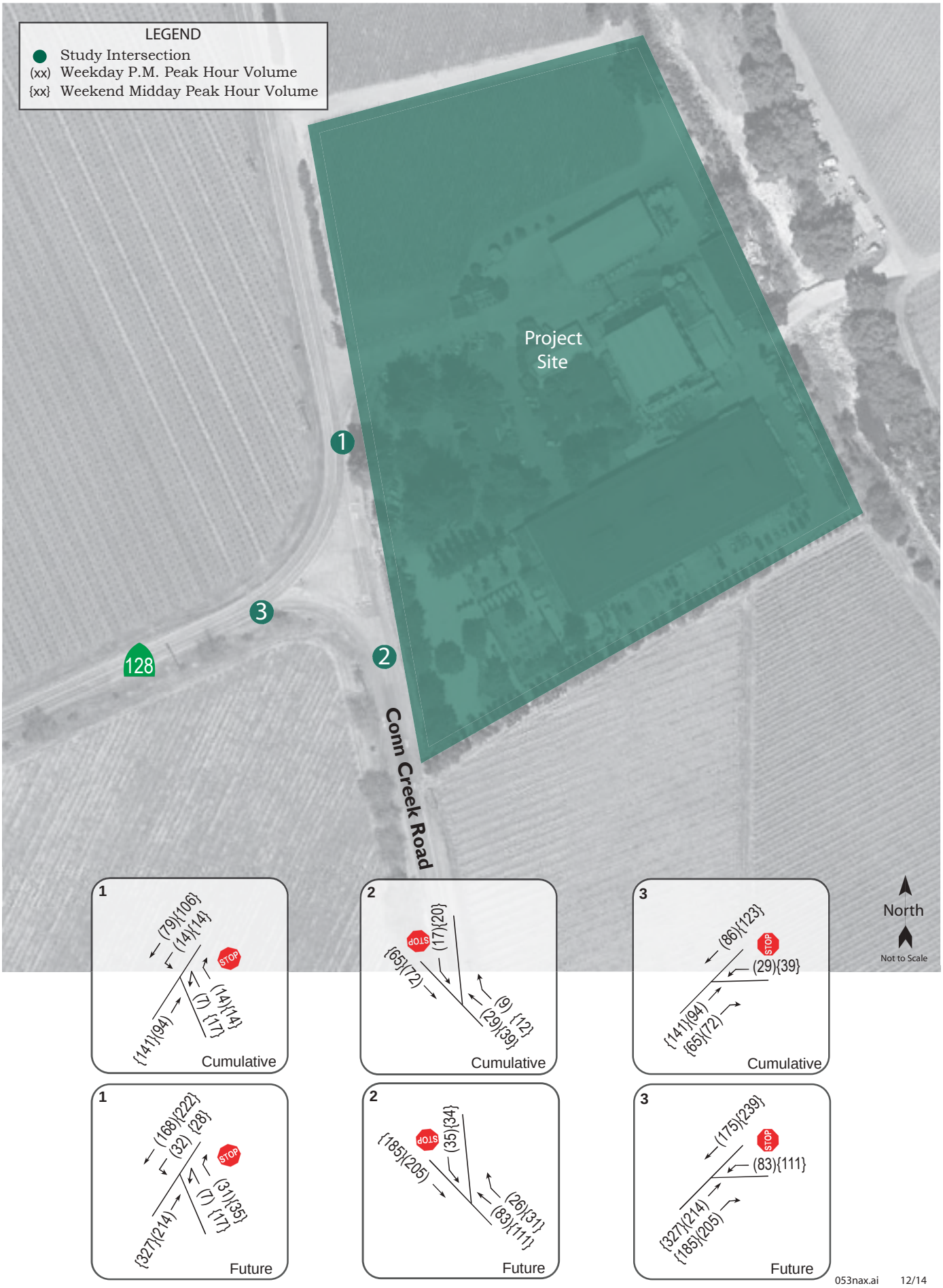

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Figure 3 – Cumulative and Future Traffic Volumes

Table 3
Cumulative Peak Hour Intersection Levels of Service

Study Intersection *Approach*	Cumulative Conditions			
	Weekday PM Peak		Weekend MD Peak	
	Delay	LOS	Delay	LOS
1. SR 128/Conn Creek Rd (north)	1.5	A	1.5	A
Conn Creek Rd (northbound)	*9.3*	*A*	*10.0*	*A*
2. SR 128/Conn Creek Rd (south)	1.2	A	1.4	A
Conn Creek Rd (southbound)	*9.2*	*A*	*9.2*	*A*
3. SR 128/Conn Creek Rd (west)	1.0	A	1.1	A
Conn Creek Rd (westbound)	*10.2*	*B*	*10.8*	*B*
4. SR 128/SR 29	17.8	C	**55.5**	**F**
Eastbound Approach	*57.4*	*F*	**	*F*
Westbound Approach	**	*F*	**	*F*
With recommended improvements	9.2	A	11.2	B
5. SR 128-Conn Creek Rd/Silverado Trail S	10.9	B	4.9	A
Eastbound Approach	*112.1*	*F*	*30.9*	*D*
Westbound Approach	*82.3*	*F*	*23.7*	*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*; ** Delay greater than 120 seconds; **Bold** text indicates deficient operation; Shaded cells = operation with improvements

Findings: As noted for Existing Conditions, SR 128/SR 29 is operating deficiently and will further deteriorate under anticipated short-term volumes. The County of Napa has identified the need for improvements at the intersection in its General Plan.

Recommendation: The County should include improvements, as called for in the General Plan, in the traffic impact fee structure that is currently being developed in accord with Action Item CIR-19.1, and the necessary improvements should be included in the traffic impact fee.

Future Conditions

The Future traffic scenario represents General Plan buildout for the horizon year 2030. Future projected traffic volumes for SR 128/Conn Creek Road and SR 29/SR 128 were obtained from the Solano Transportation Authority (STA) who maintains the joint Napa County/Solano County 2010-2030 Travel Demand Forecasting Model. This data was provided in the form of segment volumes. An annual growth rate of 6 percent was calculated based on the existing and projected p.m. peak hour segment volumes near SR 128/Conn Creek Road while an annual growth rate of 3.8 percent was calculated based on p.m. peak hour segment volumes near SR 128/SR 29. The model does not include forecasts for the weekend midday peak hour; therefore, the weekday p.m. peak hour growth rate was applied to the weekend midday peak to analyze future operations. Using Year 2012 as the base year for SR 128/Conn Creek Road, a growth factor of 2.85 was applied to the existing volumes to estimate the 2030 build-out volumes. Using Year 2015 as the base year for SR 128/SR 29, a growth factor of 1.75 was applied to existing volumes to estimate the 2030 build-out volumes. It should be noted that a growth factor was

not applied to the volumes currently accessing the site via the center driveway located opposite the west leg of SR 128 at Conn Creek Road. Future volumes for the SR 128-Conn Creek Road/Silverado Trail intersection were taken from the *Frog's Leap Winery Revised Traffic Study* by Omni-Means, dated December 15, 2014. Future 2030 build-out volumes are shown in Figures 1 and 3.

Under the anticipated Future volumes, the SR 128/Conn Creek Road study intersections are expected to operate at LOS A overall, while SR 128/SR 29 and SR 128/Silverado Trail South are expected to operate unacceptably at LOS F and LOS E, respectively, with the eastbound and westbound approaches for these intersections operating at LOS F during both peak hours. Operating conditions are summarized in Table 4 and copies of the Level of Service calculations are provided in Appendix B.

Table 4
Future Peak Hour Intersection Levels of Service

Study Intersection ***Approach***	**Future Conditions**			
	Weekday PM Peak		**Weekend MD Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. SR 128/Conn Creek Rd (north)	1.4	A	1.4	A
Conn Creek Rd (northbound)	*9.1*	*A*	*9.8*	*A*
2. SR 128/Conn Creek Rd (south)	1.2	A	1.3	A
Conn Creek Rd (southbound)	*9.1*	*A*	*9.2*	*A*
3. SR 128/Conn Creek Rd (west)	1.0	A	1.1	A
Conn Creek Rd (westbound)	*9.8*	*A*	*10.5*	*B*
4. SR 128/SR 29	******	**F**	******	**F**
Eastbound Approach	**	*F*	**	*F*
Westbound Approach	**	*F*	**	*F*
Signalized plus added lanes on SR 29	15.3	B	20.0	C
5. SR 128-Conn Creek Rd/Silverado Trail S	**42.4**	**E**	**44.3**	**E**
Eastbound Approach	**	*F*	**	*F*
Westbound Approach	**	*F*	**	*F*
Signalized	20.6	C	7.6	A

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;* ** Delay greater than 120 seconds; **Bold** text indicates deficient operation; Shaded cells = operation with installation of traffic signal

Findings: Both SR 128 intersections (at SR 29 and at Silverado Trail) are expected to continue to operate deficiently during both the weekday p.m. and weekend midday peak periods under anticipated future volumes.

Recommendation: As noted for previous scenarios, the County should include infrastructure improvements identified in the General Plan as being needed to accommodate current and future traffic demands in the traffic impact fee. Policy CIR-13 indicates the need for improvements to maintain a roadway system that is safe and efficient in terms of providing local access and includes the intersections of SR 128 with both SR 29 and Silverado Trail. To achieve acceptable operation at SR 128/SR 29 under

future volumes, in addition to a traffic signal a second lane will be needed in both directions on SR 29 at the intersection. Both of these projects should therefore be part of the County's traffic impact fee program.

Roadways

According to the GPUDEIR, under projected 2030 volumes SR 29 is expected to operate at LOS F in the study area and Silverado Trail is expected to operate at LOS D. The General Plan does not indicate any plans for improving operation on either of these roadways through added capacity though policies supporting projects that facilitate local access through intersection improvements are included.

Project Description

The project site is occupied by a winery that produced 2.25 million gallons of wine per year in 2013 and has a retail sales/tasting room. The existing facility is currently permitted to produce 110,000 gallons. The proposed project would increase the average number of visitors at the tasting room from the existing numbers of 208 per day on weekdays and 312 on weekends (or maximums of 300 and 450 visitors on weekdays and weekends, respectively) to averages of 346 per day on weekdays and 589 per day on weekend days, or maximums of 500 and 850 for weekdays and weekends, increase the number of full-time and part-time employees and increase the wine production from the permitted allowance of 110,000 gallons per year to 1.8 million gallons per year.

Vehicular access to the project site is currently provided via four driveways located along the project frontage. With the changes proposed, vehicular access to the site would be via two driveways. The existing driveway located on SR 128 would be moved north from its current location and would be a full access driveway for visitors, and used for outbound staff and trucks. The two driveways located at the center of the project frontage and opposite the triangular median would be closed off completely. The southernmost driveway on Conn Creek Road would not move though it would be restricted to inbound staff and truck deliveries only. Outbound employee traffic and trucks would be required to exit the site via the northernmost driveway. The proposed project site plan is shown in Figure 4.

Trip Generation

The anticipated trip generation for a proposed project is typically estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 9th Edition, 2012. However, the ITE publication contains no such information for a winery. Therefore, the County of Napa's *Winery Traffic Information/Trip Generation Sheet* was used to determine the anticipated traffic that would be generated by the proposed expansion of the Caymus Winery tasting room's permitted visitation. Trip generation was estimated for the following three scenarios:

- Permitted use
- Existing use
- Proposed use

Copies of the trip generation sheets for each of these scenarios are provided in Appendix C and the trip generation for the three scenarios is summarized in Table 5. It should be noted that the trips associated with the permitted use are shown for informational purposes only.

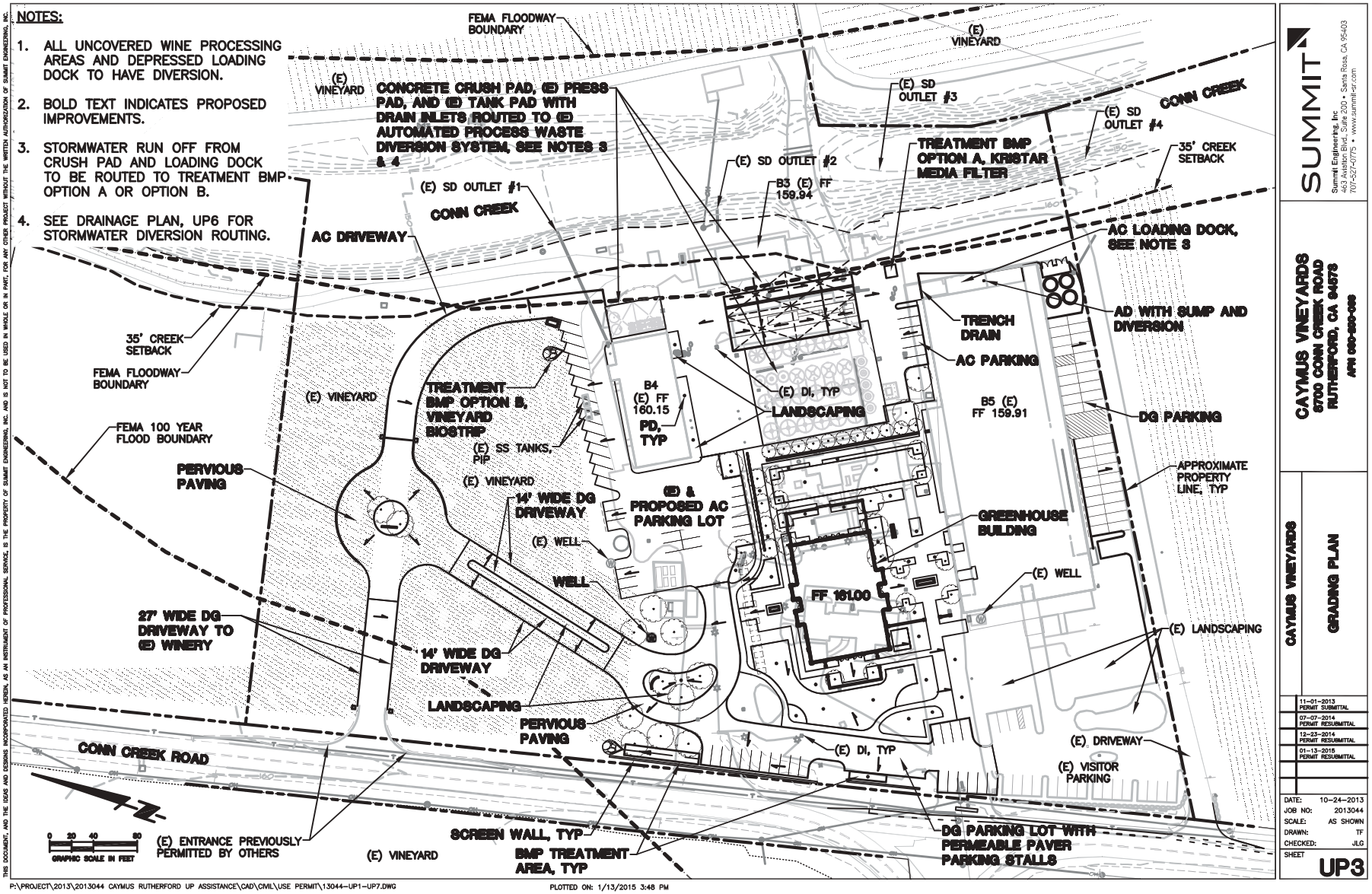

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Figure 4 – Site Plan

Table 5
Trip Generation Comparison

Scenario	Weekday Trips		Weekend Trips	
	Daily	PM Peak	Daily	MD Peak
Permitted Use	112	40	105	48
Existing Use	355	125	252	136
Proposed Use	478	170	480	258

Project Trip Generation Summary

The proposed project is expected to generate an average of 478 weekday daily trips, of which, according to the County's methodology, 170 would occur during the p.m. peak hour. On weekends, the site is expected to generate an average of 480 daily trips, including 258 trips during the midday peak hour. Since the County of Napa's *Winery Traffic Information/Trip Generation Sheet* does not include guidance on inbound versus outbound trips, it was assumed that 75 percent of trips 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 businesses. For the weekend midday peak hour, it was assumed that inbound and outbound trips would be evenly split.

After deductions are applied to take into account the permitted use at the site, the project would result in an increase of 366 daily vehicle trips, including 130 trips during the weekday p.m. peak hour. On weekends, the project would generate an additional 375 daily vehicle trips, including 210 midday peak hour trips. It should be noted that the County's trip generation methodology indicates that 38 percent of daily tasting trips occur during the p.m. peak hour and 54 percent of weekend trips occur during the midday peak hour. Data previously collected by W-Trans at a Sonoma County Winery was used to develop factors for winery tasting room trips made during both the p.m. and weekend midday peak hour.

These winery driveway counts were collected one week every month for a year and indicate that 10 percent of the daily tasting trips occur during the p.m. peak hour and 13 percent during the weekend midday peak. For the purpose of this analysis, the more conservative Napa County assumptions were used to calculate project-generated trips. These new trips represent the increase in traffic associated with the project compared to permitted volumes. A summary of the project's trip generation potential, including a comparison showing the net increase of traffic volumes for the proposed project as compared to existing roadway conditions, is provided in Table 6. As compared to existing conditions, the project would generate an additional 123 daily weekday trips, including 45 trips during the weekday p.m. peak hour, and 228 daily weekend trips, including 122 during the weekend midday peak hour.

Table 6
Project Trip Generation

Land Use	Daily Trips		Weekday PM Peak Hour			Weekend Midday Peak Hour		
	Weekday	Weekend	Trips	In	Out	Trips	In	Out
Net Increase on Roadways								
Existing Use	-355	-252	-125	-31	-94	-136	-68	-68
Proposed Use	478	480	170	43	127	258	129	129
Total Net-New Roadway Trips	**123**	**228**	**45**	**12**	**33**	**122**	**61**	**61**
Project Trips								
Permitted Use	-112	-105	-40	-10	-30	-48	-24	-24
Proposed Use	478	480	170	43	127	258	129	129
Total Net-New Project Trips	**366**	**375**	**130**	**33**	**97**	**210**	**105**	**105**

Trip Distribution

The pattern used to allocate new project trips to the street network was based on the existing traffic volumes at the study intersections and access points to the project site. The applied distribution assumptions for visitors, employees, and trucks for both weekday and weekend traffic are shown in Table 7.

Table 7
Trip Distribution Assumptions

User Group *Route*	Percent	Weekday Trips	Weekend Trips	PM Trips	MD Trips
Visitors					
SR 128 (from the west)	*50%*	*104*	*184*	*40*	*104*
SR 128 (from the east)	*50%*	*104*	*184*	*39*	*104*
Conn Creek Road (from the south)	*0%*	*0*	*0*	*0*	*0*
Subtotal	100%	208	368	79	208
Employees					
SR 128 (from the west)	*40%*	*51*	*3*	*16*	*1*
SR 128 (from the east)	*25%*	*32*	*2*	*10*	*0*
Conn Creek Road (from the south)	*35%*	*45*	*2*	*14*	*1*
Subtotal	100%	128	7	40	2
Trucks					
SR 128 (from the west)	*40%*	*12*	*0*	*4*	*0*
SR 128 (from the east)	*25%*	*8*	*0*	*4*	*0*
Conn Creek Road (from the south)	*35%*	*10*	*0*	*3*	*0*
Subtotal	100%	30	0	11	0
TOTAL		**366**	**375**	**130**	**210**

Trips were assigned based on the street network, project driveways and site plan. It was assumed that 100 percent of visitor related project trips would use the north driveway for both inbound and outbound trips. Inbound staff trips and trucks trips were assumed to use the southern driveway while all outbound employee trips and truck trips were assigned to the north driveway. Based on the above assumptions, the resulting project trips are shown in Figures 1 and 3.

Existing plus Project Conditions

Upon the addition of project-related traffic to the existing volumes, all of the study intersections are expected to operate at the same levels of service as without the project, except SR 128/SR 29 which degrades to unacceptable LOS E overall during the p.m. peak hour and to LOS F overall during the midday peak hour. The side street approaches continue operating at the same levels of service at SR 128/SR 29 and SR 128/Silverado Trail South. These results are summarized in Table 8 and copies of the Level of Service calculations are provided in Appendix B.

Table 8
Existing and Existing plus Project Peak Hour Intersection Levels of Service

Study Intersection *Approach*	Existing Conditions				Existing plus Project			
	Weekday PM Peak		Weekend MD Peak		Weekday PM Peak		Weekend MD Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. SR 128/Conn Creek Rd (north)	1.7	A	1.6	A	1.7	A	1.1	A
Conn Creek Rd (northbound)	*9.1*	*A*	*9.6*	*A*	*9.4*	*A*	*10.6*	*B*
2. SR 128/Conn Creek Rd (south)	1.2	A	1.2	A	2.0	A	1.2	A
Conn Creek Rd (southbound)	*9.2*	*A*	*9.2*	*A*	*9.4*	*A*	*9.2*	*A*
3. SR 128/Conn Creek Rd (west)	1.2	A	1.3	A	0.9	A	1.0	A
Conn Creek Rd (westbound)	*9.8*	*A*	*10.3*	*B*	*10.5*	*B*	*11.8*	*B*
4. SR 128/SR 29	14.3	B	**42.0**	**E**	**47.8**	**E**	**	**F**
Eastbound Approach	*29.7*	*D*	*85.3*	*F*	*30.7*	*D*	**	*F*
Westbound Approach	**	*F*	**	*F*	**	*F*	**	*F*
Signalized	8.3	A	9.6	A	10.8	B	12.9	B
5. SR 128-Conn Creek Rd/ Silverado Trail S	7.0	A	3.6	A	11.7	B	4.9	A
Eastbound Approach	*77.0*	*F*	*26.0*	*D*	*116.6*	*F*	*30.9*	*D*
Westbound Approach	*70.2*	*F*	*21.5*	*C*	*81.6*	*F*	*23.3*	*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*; ** Delay greater than 120 seconds; **Bold** text indicates deficient operation; Shaded cells = operation with installation of traffic signal

Finding: Under Existing plus Project conditions, SR 128/SR 29 would degrade from acceptable LOS B to unacceptable LOS E during the weekday p.m. peak hour and would further degrade from unacceptable LOS E to LOS F during the weekend midday peak hour. This intersection is already operating unacceptably during the weekend peak period and signalization or other improvements to facilitate access are supported in the General Plan and should be included in the County's traffic impact fee.

Recommendation: The project results in further deterioration of operation at SR 128/SR 29, including unacceptable operation during the weekday p.m. peak hour. However, because this project should be part of the traffic impact fee program, it is recommended that the applicant pay their traffic impact fee to mitigate project impacts. If the fee has not yet been adopted at the time when fees are to be paid, a proportional share fee of 6.8 percent could instead be levied on the condition that it is transferred into the traffic impact fee fund at such time as it is established. The proportional share calculation is provided in Appendix D.

Cumulative plus Project Conditions

Upon the addition of project-related traffic to cumulative volumes, all of the study intersections are expected to operate at LOS C or better, except SR 128/SR 29 which would be expected to degrade to unacceptable LOS F overall during the p.m. peak hour and continue operating at LOS F during the midday peak hour. The side street approaches at SR 128/SR 29 and SR 128/Silverado Trail South would

continue operating at the same levels of service. These results are summarized in Table 9 and copies of the Level of Service calculations are provided in Appendix B.

Table 9
Cumulative and Cumulative plus Project Peak Hour Intersection Levels of Service

Study Intersection *Approach*	Cumulative Conditions				Cumulative plus Project			
	Weekday PM Peak		Weekend MD Peak		Weekday PM Peak		Weekend MD Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. SR 128/Conn Creek Rd (north)	1.5	A	1.5	A	1.5	A	1.0	A
Conn Creek Rd (northbound)	*9.3*	*A*	*10.0*	*A*	*9.6*	*A*	*11.0*	*B*
2. SR 128/Conn Creek Rd (south)	1.2	A	1.4	A	2.1	A	1.3	A
Conn Creek Rd (southbound)	*9.2*	*A*	*9.2*	*A*	*9.4*	*A*	*9.2*	*A*
3. SR 128/Conn Creek Rd (west)	1.0	A	1.1	A	0.9	A	0.9	A
Conn Creek Rd (westbound)	*10.2*	*B*	*10.8*	*B*	*10.9*	*B*	*12.4*	*B*
4. SR 128/SR 29	17.8	C	**55.5**	**F**	**55.8**	**F**	**	**F**
Eastbound Approach	*57.4*	*F*	**	*F*	*67.9*	*F*	**	*F*
Westbound Approach	**	*F*	**	*F*	**	*F*	**	*F*
Signalized	9.2	A	11.2	B	11.6	B	15.4	B
5. SR 128-Conn Creek Rd/ Silverado Trail S	10.9	B	4.9	A	18.3	C	6.7	A
Eastbound Approach	*112.1*	*F*	*30.9*	*D*	**	*F*	*39.1*	*E*
Westbound Approach	*82.3*	*F*	*23.7*	*C*	*97.1*	*F*	*25.9*	*D*

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*; ** Delay greater than 120 seconds; **Bold** text indicates deficient operation; Shaded cells = operation with installation of traffic signal

Finding: Under Cumulative plus Project conditions, operation at SR 128/SR 29 is expected to degrade from acceptable LOS C to LOS F during the weekday p.m. peak hour and the intersection would continue operating at unacceptable LOS F during the weekend midday peak hour, with increased delay on the stop-controlled side-street approaches. This is a significant impact.

Recommendation: The project applicant should pay the County's traffic impact fee at such time as it is established, or a proportional share in the interim, to support construction of a traffic signal at SR 128/SR 29.

Future plus Project Conditions

Upon the addition of project-generated traffic to the anticipated Future volumes, the study intersections are SR 128/Conn Creek Road are expected to operate at LOS A overall, while SR 128/SR 29 is expected to continue operating deficiently at LOS F and SR 128-Conn Creek Road/Silverado Trail South is expected to degrade from unacceptable LOS E to LOS F during both peak hours. These results are summarized in Table 10 and copies of the Level of Service calculations are provided in Appendix B.

Table 10
Future and Future plus Project Peak Hour Levels of Service

Study Intersection *Approach*	Future Conditions				Future plus Project			
	Weekday PM Peak		Weekend MD Peak		Weekday PM Peak		Weekend MD Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. SR 128/Conn Creek Rd (north)	1.4	A	1.4	A	1.5	A	1.0	A
Conn Creek Rd (northbound)	*9.1*	*A*	*9.8*	*A*	*9.4*	*A*	*10.7*	*B*
2. SR 128/Conn Creek Rd (south)	1.2	A	1.3	A	2.1	A	1.3	A
Conn Creek Rd (southbound)	*9.1*	*A*	*9.2*	*A*	*9.2*	*A*	*9.2*	*A*
3. SR 128/Conn Creek Rd (west)	1.0	A	1.1	A	0.8	A	0.9	A
Conn Creek Rd (westbound)	*9.8*	*A*	*10.5*	*B*	*10.4*	*B*	*11.9*	*B*
4. SR 128/SR 29	**504.2**	**F**	**710.0**	**F**	**676.6**	**F**	***>1,000***	**F**
Eastbound Approach	**	*F*	**	*F*	**	*F*	**	*F*
Westbound Approach	**	*F*	**	*F*	**	*F*	**	*F*
Signalized	15.3	B	20.0	C	19.8	B	35.8	D
5. SR 128-Conn Creek Rd/ Silverado Trail S	**42.4**	**E**	**44.3**	**E**	**66.8**	**F**	**68.8**	**F**
Eastbound Approach	**	*F*	**	*F*	**	*F*	**	*F*
Westbound Approach	**	*F*	**	*F*	**	*F*	**	*F*
With Traffic Signal	20.6	C	7.6	A	25.3	C	8.6	A

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*; ** Delay greater than 120 seconds; **Bold** text indicates deficient operation; Shaded cells = operation with installation of traffic signal

Finding: SR 128/SR 29 is expected to continue operating deficiently at LOS F while SR 128-Conn Creek Road would degrade to unacceptable LOS F. The project-added traffic would result in substantial further deterioration of operation at SR 128/SR 29 without implementation of improvements necessary to accommodate regional growth in areawide traffic.

Recommendation: The applicant should pay the applicable traffic impact fees or proportional share fees to support installation of traffic signals at SR 128/SR 29 and at SR 128/Silverado Trail South. The proportional share for Silverado Trail/SR 128 is 57.9 percent, as shown in the calculation provided in Appendix D.

Roadways

The additional traffic that the project would generate would reasonably be expected to be included in the growth projected by the County's traffic model.

The General Plan contains policies that support roadway improvements that would increase safety and access to the project site.

Recommendation: It is recommended that the applicant construct improvements at SR 128/Conn Creek Road, enhancing safety and ease for drivers. Improvements should include constructing a landscaped median with either curbs or asphalt berms, installing clear way-finding signage to the project site and nearby destinations, and restricting turning movements on the northbound Conn Creek Road approaches. Only right turns would be allowed at SR 128/Conn Creek Road (north) and SR 128/Conn Creek (west) would be restricted to left turns, with appropriate signage indicating the turning restrictions at the approaches as well as on the landscaped island.

Alternative Modes

Bicycle Facilities

Within the project vicinity, Class II bike lanes exist on both sides of Conn Creek Road south of SR 128, though the northbound lane ends just south of the project site. According to the *Napa County Bicycle Plan*, Class II bike lanes are proposed on SR 128. The proposed project would not disrupt the existing or planned bicycle facilities. To accommodate a planned future Class II bike lane on SR 128, any frontage improvements should retain adequate width for this future improvement. Further, the bike lane along the east side of Conn Creek Road should be extended to the limit line of the stop-controlled approach at SR 128/Conn Creek Road (north) to provide adequate connectivity for the planned future Class II bike lane on SR 128.

Finding: Existing and proposed bicycle facilities serving the project site are generally adequate, though the northbound bike lane on Conn Creek Road ends short of SR 128.

Recommendation: Improvements at SR 128/Conn Creek Road should include connecting the existing Class II bike lane on the east side of Conn Creek Road to the limit line at the stop-controlled approach of SR 128/Conn Creek Road (north). The frontage improvements on SR 128 should provide adequate width to accommodate a Class II bike lane in the future.

Transportation Demand Management Plan

The project should also promote the use of public transportation and carpooling of employees (by adjusting work schedules, etc.) to facilitate the use of other transportation modes. The County has adopted several measures in the General Plan to reduce vehicle trips through public transit and Transportation Demand Management (TDM) strategies: "The project should support programs to reduce single occupant vehicle use and encourage alternative travel modes."

Finding: The winery has the ability to reduce the dependence on single vehicle occupancy trips and to tier departures by employees and tasting room visitors.

Recommendation: The winery should implement a TDM plan that reduces peak hour trips and thereby the project's impacts.

Access and Circulation

Site Access

Vehicular access to the site would be provided via one existing driveway off of Conn Creek Road and one new full access driveway on SR 128.

The north driveway on SR 128 would serve inbound and outbound visitor traffic and outbound employee and truck trips. The south driveway off of Conn Creek Road would remain as is and would be restricted to inbound staff and truck deliveries. Trucks and staff would be required to exit the site via the new north driveway. Because project traffic is separated by user, way-finding signage for tasting room traffic should be to guide visitors to the north driveway.

The traffic volumes collected in October 2012 at the SR 128/Conn Creek Road intersection indicated that motorists were exiting out of the center driveway and making a westbound through movement across the median onto SR 128, which is illegal. Similarly, motorists were making an illegal eastbound through movement from SR 128 in to the winery via the center driveway.

By closing the two driveways located across from the dirt median, previous conflicts will be reduced while the two project driveways will maintain local access. As previously stated, the unusual configuration of SR 128/Conn Creek Road lends itself to illegal movements by motorists. Installing a landscaped median with curbs or asphalt berms would prevent motorists from making these illegal movements and would be expected to improve safety.

Recommendations

To allow for the ease of access by visitors, employees and trucks to the site the following driveway layout scheme, which is what is being proposed, is supported:

- *North driveway (on SR 128)*: should provide access to inbound and outbound visitors and outbound staff and trucks.

- *South driveway (Conn Creek Road)*: should provide access to inbound staff and trucks.

Internal Circulation

Internal circulation for passenger vehicles was evaluated. The proposed north driveway would connect to a small traffic circle, which would provide access to the visitor parking areas located along the project frontage. The south driveway would connect to the staff parking, which is located on the south side of the winery building (B5). Internal circulation for the passenger vehicles is anticipated to be adequate.

Sight Distance

At unsignalized intersections 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. Adequate time must be provided for the waiting vehicle to either cross, turn left, or turn right, without requiring the through traffic to radically alter their speed.

Sight distance along SR 128 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 intersections of public streets is based on corner sight distances, while recommended sight distances for minor street approaches that are either a private road or a driveway are based on stopping sight distance. Both use the approach travel speeds as the basis for determining the recommended sight

distance. For a 45-mph posted speed limit on SR 128, the recommended stopping sight distance for a private driveway is 360 feet. Though speeds would be lower on Conn Creek Road due to the proximity to the intersection with SR 128, the same criterion was applied to both roads.

Sight distance at the proposed driveways was measured electronically on Google Earth based on field notes obtained during a site visit. SR 128 and Conn Creek Road are reasonably flat and straight on the approaches to both driveways. Available sight lines are more than adequate and meet the recommended distance for the prevailing travel speeds.

Access Analysis

Turn Lane Warrants

The need for left-turn lanes on SR 128 and Conn Creek Road at the project driveways was evaluated based on criteria contained in the *Napa County Road and Street Standards*, 2011. Based on the turning movement volumes obtained at the intersection of SR 128/Conn Creek Road in October 2012, SR 128 has an average daily traffic (ADT) volume of 2,200 vehicles near the north driveway, while Conn Creek Road has an average daily traffic of volume of 1,200 vehicles, near the south driveway.

Using the County's criteria, for an average daily traffic volume of 2,200 vehicles on SR 128 and 1,200 vehicles on Conn Creek Road, a left-turn lane would be warranted if a project driveway has an ADT of 70 or 130 vehicles or more respectively. The total number of inbound left-turns daily at the north driveway is 133 vehicles and for the south driveway it is 127 vehicles. Based on these traffic levels, a left-turn lane would be warranted at the north driveway, but not warranted at the south driveway.

Because SR 128 is owned, operated and maintained by Caltrans, the need for a left-turn lane at the north driveway was evaluated using criteria contained in the *Intersection Channelization Design Guide*, National Cooperative Highway Research Program (NCHRP) Report No. 279, Transportation Research Board, 1985, as well as a more recent update of the methodology developed by the Washington State Department of Transportation. The NCHRP report references a methodology developed by M. D. Harmelink that includes equations that can be applied to expected or actual traffic volumes in order to determine the need for a left-turn pocket based on safety issues. This is a common analysis technique that is applied in numerous cities and counties in the region, and is consistent with methodologies used by Caltrans. Future plus Project volumes during the weekday p.m. and weekend midday peak hours were used for this analysis. Using these traffic volumes, a left-turn lane is not warranted at the north project driveway. However, a right-turn taper would be warranted for the north driveway based on traffic volumes for the weekend midday peak hour.

Although application of the County of Napa's criteria would result in the need for a left-turn lane at the Caymus Winery's north driveway, there is no apparent need for a left-turn lane when the more detailed methodology that is accepted by Caltrans is applied. Installation of a left-turn lane at either project driveway is not recommended at this time, though an exception to the County's policy may need to be requested for the north driveway. Turn lane warrant calculations are provided in Appendix D.

Findings: Left-turn lanes are not warranted at either project driveway, though an exception to the County's roadway policy may be needed for the north driveway. A right-turn taper would be warranted based on traffic volumes for the Future plus Project weekend midday peak hour.

Recommendation: The applicant should install a right-turn taper for northbound vehicles turning right into the north project driveway.

Conclusions and Recommendations

Conclusions

- Compared to existing conditions, the proposed project would increase the average number of visitors and the number of employees, but decrease wine production. Versus permitted conditions, the proposed project would increase the average number of visitors and employees and increase wine production.

- Compared to existing conditions, it is expected that the proposed project would result in 45 new trips during the weekday p.m. peak hour and 122 new trips during the weekend midday peak hour. Versus permitted conditions, it is expected that the proposed project would result in an increase of 130 trips during the weekday p.m. peak hour and 210 trips during the weekend midday peak hour.

- Currently, the SR 128/Conn Creek Road intersections operate at LOS A overall and would continue to do so with the addition of project generated traffic under all scenarios evaluated.

- SR 128/SR 29 currently operates deficiently at LOS E during the weekend midday peak hour under existing volumes; with the project the intersection would be expected to operate unacceptably during both peak hours. Operation is projected to deteriorate to LOS F during the weekend midday peak hour under Cumulative Conditions, and during both the weekday p.m. and weekend midday peak hours with project trips added. Unacceptable LOS F operation is projected both without and with the project under anticipated Future volumes. Acceptable operation could be achieved for all scenarios with installation of a traffic signal; a second lane in each direction on SR 29 is needed to acceptably accommodate Future volumes.

- SR 128/Silverado Trail South currently operates acceptably and will continue to do so under Cumulative volumes both with and without the project. Under Future volumes unacceptable operation is expected without and with the project, though acceptable operation could be achieved through signalization of the intersection.

- SR 29 and Silverado Trail are expected to continue operating at the Levels of Service described in the General Plan with project trips added.

- The calculated collision rate for the study segment was slightly higher than the statewide average for similar facilities.

- The proposed project would not disrupt either existing or planned bicycle facilities.

- Acceptable clear sight lines are available in both directions from all existing and proposed driveways.

- Installation of a left-turn lane is not warranted at the south driveway per County criteria or at the north project driveway using Caltrans-accepted criteria.

- A right-turn taper is warranted at the north driveway per Caltrans-accepted criteria.

Recommendations

- The applicant should pay either established traffic impact fees or proportional share fees toward the cost of traffic signal installations at SR 128/SR 29 and SR 128/Silverado Trail South, or comparable improvements that result in acceptable operating conditions.

- A landscaped median with either curbs or asphalt berms should be constructed at SR 128/Conn Creek Road, including clear way-finding signage to the project site and nearby destinations.

- Left turns should be prohibited at SR 128/Conn Creek Road (north) and right turns prohibited at SR 128/Conn Creek (west) through use of appropriate signage on the median and approach to the intersection.

- The bike lane on the east side of Conn Creek Road should be extended from its existing terminus at the southerly boundary of the project site north to the intersection of SR 128/Conn Creek Road (north).

- It is recommended that adequate width be provided to accommodate a Class II bike lane on the SR 128 project frontage.

- It is recommended that the north driveway provide access to inbound and outbound visitors and outbound trucks while the south driveway provide access to inbound and outbound staff as well as inbound trucks. Clear signage informing tasting room visitors to use the north driveway should be posted.

- A right-turn taper should be installed on SR 128 at the north driveway.

Study Participants and References

Study Participants

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Associate Engineer:	Smadar Boardman, EIT
Technician/Graphics:	Deborah J. Mizell
Editing/Formatting:	Angela McCoy

References

2009 Collision Data on California State Highways, California Department of Transportation, 2009
Frog's Leap Winery Traffic Study, Omni-Means, 2014
Highway Capacity Manual, Transportation Research Board, 2000
Highway Design Manual, 6th Edition, California Department of Transportation, 2012
Intersection Channelization Design Guide, National Cooperative Highway Research Program (NCHRP) Report No. 279, Transportation Research Board, 1985
Napa County Bicycle Plan, Napa County Transportation and Planning Agency, 2012
Napa County General Plan Update Environmental Impact Report, County of Napa, 2008
Napa County General Plan, County of Napa, 2009
Napa County Road and Street Standards, County of Napa, 2011
Statewide Integrated Traffic Records System (SWITRS), California Highway Patrol, 2006-2011
Trip Generation Manual, 9th Edition, Institute of Transportation Engineers, 2012

Communications

Conversation with Mr. Paul Wilkinson, April 21, 2015, regarding status of impact fee report

NAX053

Appendix A

Collision Rate Calculations

SEGMENT COLLISION RATE CALCULATIONS

Traffic Impact Study for Caymus Winery In Napa County

Location: SR 128 near Rutherford Road/Conn Creek Road

Date of Count: 2010 and 2011 Counts from Caltrans
ADT: 2,500

Number of Collisions: 5
Number of Injuries: 0
Number of Fatalities: 1
Start Date: January 1, 2007
End Date: December 31, 2011
Number of Years: 5

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

Segment Length: 1.0 miles
Direction: East/West

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

$$\frac{5 \times 1{,}000{,}000}{2{,}500 \times 365 \times 1 \times 5}$$

	Collision Rate		Fatality Rate	Injury Rate
Study Segment	**1.10**	**c/mvm**	**20.0%**	**0.0%**
Statewide Average*	**1.09**	**c/mvm**	**2.4%**	**38.0%**

ADT = average daily traffic volume
c/mvm = collisions per million vehicle miles
* 2009 Collision Data on California State Highways, Caltrans

Appendix B

Intersection Level of Service Calculations

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	75	0	13	59	7	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.92	0.92	0.84	0.84
Hourly flow rate (vph)	89	0	14	64	8	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			89		182	89
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			89		182	89
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	98
cM capacity (veh/h)			1506		800	969

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	89	78	25
Volume Left	0	14	8
Volume Right	0	0	17
cSH	1700	1506	905
Volume to Capacity	0.05	0.01	0.03
Queue Length 95th (ft)	0	1	2
Control Delay (s)	0.0	1.4	9.1
Lane LOS		A	A
Approach Delay (s)	0.0	1.4	9.1
Approach LOS			A

Intersection Summary				
Average Delay			1.7	
Intersection Capacity Utilization			20.5%	ICU Level of Service A
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	115	0	11	78	17	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	128	0	12	87	19	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			128		239	128
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			128		239	128
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	98
cM capacity (veh/h)			1458		743	922

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	128	99	33
Volume Left	0	12	19
Volume Right	0	0	14
cSH	1700	1458	811
Volume to Capacity	0.08	0.01	0.04
Queue Length 95th (ft)	0	1	3
Control Delay (s)	0.0	1.0	9.6
Lane LOS		A	A
Approach Delay (s)	0.0	1.0	9.6
Approach LOS			A

Intersection Summary				
Average Delay			1.6	
Intersection Capacity Utilization			21.4%	ICU Level of Service A
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north) 4/14/2015

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	16	0	0	72	29	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	19	0	0	86	35	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	126	40	45			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	126	40	45			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	869	1031	1563			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	19	86	45
Volume Left	19	0	0
Volume Right	0	0	11
cSH	869	1700	1700
Volume to Capacity	0.02	0.05	0.03
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization		13.8%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north) 4/14/2015

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	17	0	0	65	39	11
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	19	0	0	72	43	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	122	49	56			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	122	49	56			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	874	1019	1549			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	19	72	56
Volume Left	19	0	0
Volume Right	0	0	12
cSH	874	1700	1700
Volume to Capacity	0.02	0.04	0.03
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization		13.4%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west) 4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	75	72	0	66	29	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	89	86	0	79	35	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			175		211	132
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			175		211	132
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	100
cM capacity (veh/h)			1401		778	917

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	175	79	35
Volume Left	0	0	35
Volume Right	86	0	0
cSH	1700	1700	778
Volume to Capacity	0.10	0.05	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.0	0.0	9.8
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.8
Approach LOS			A

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization		18.4%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west) 4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	115	65	0	95	39	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	128	72	0	106	43	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			200		269	164
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			200		269	164
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		94	100
cM capacity (veh/h)			1372		720	881

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	200	106	43
Volume Left	0	0	43
Volume Right	72	0	0
cSH	1700	1700	720
Volume to Capacity	0.12	0.06	0.06
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.0	0.0	10.3
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.3
Approach LOS			B

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization		20.0%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	4	13	52	1	36	2	578	77	92	924	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	4	14	55	1	38	2	608	81	97	973	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1818	1861	974	1835	1822	649	975			689		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1818	1861	974	1835	1822	649	975			689		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	94	96	0	98	92	100			89		
cM capacity (veh/h)	50	65	306	49	69	470	708			905		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	18	94	2	689	97	975
Volume Left	0	55	2	0	97	0
Volume Right	14	38	0	81	0	2
cSH	164	77	708	1700	905	1700
Volume to Capacity	0.11	1.22	0.00	0.41	0.11	0.57
Queue Length 95th (ft)	9	177	0	0	9	0
Control Delay (s)	29.7	270.1	10.1	0.0	9.5	0.0
Lane LOS	D	F	B		A	
Approach Delay (s)	29.7	270.1	0.0		0.9	
Approach LOS	D	F				

Intersection Summary					
Average Delay	14.3				
Intersection Capacity Utilization	73.9%	ICU Level of Service		D	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	0	18	60	1	66	7	856	91	70	977	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	8	0	19	62	1	68	7	882	94	72	1007	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2123	2148	1013	2114	2108	929	1020			976		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2123	2148	1013	2114	2108	929	1020			976		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	68	100	94	0	98	79	99			90		
cM capacity (veh/h)	26	43	290	32	45	324	681			707		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	27	131	7	976	72	1020
Volume Left	8	62	7	0	72	0
Volume Right	19	68	0	94	0	12
cSH	70	60	681	1700	707	1700
Volume to Capacity	0.38	2.19	0.01	0.57	0.10	0.60
Queue Length 95th (ft)	37	318	1	0	8	0
Control Delay (s)	85.3	692.8	10.3	0.0	10.7	0.0
Lane LOS	F	F	B		B	
Approach Delay (s)	85.3	692.8	0.1		0.7	
Approach LOS	F	F				

Intersection Summary					
Average Delay	42.0				
Intersection Capacity Utilization	76.7%	ICU Level of Service		D	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	49	1	53	28	1	6	13	380	1	6	938	32
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	53	1	57	30	1	6	14	409	1	6	1009	34
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1482	1476	1026	1516	1493	409	1043			410		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1482	1476	1026	1516	1493	409	1043			410		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	47	99	80	60	99	99	98			99		
cM capacity (veh/h)	100	123	285	76	120	642	667			1149		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	111	38	14	410	6	1043
Volume Left	53	30	14	0	6	0
Volume Right	57	6	0	1	0	34
cSH	150	91	667	1700	1149	1700
Volume to Capacity	0.74	0.41	0.02	0.24	0.01	0.61
Queue Length 95th (ft)	111	42	2	0	0	0
Control Delay (s)	77.0	70.2	10.5	0.0	8.2	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	77.0	70.2	0.3		0.1	
Approach LOS	F	F				

Intersection Summary					
Average Delay	7.0				
Intersection Capacity Utilization	63.9%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	62	6	27	17	1	5	46	273	10	19	482	19
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	66	6	29	18	1	5	49	290	11	20	513	20
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	957	962	523	979	967	296	533			301		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	957	962	523	979	967	296	533			301		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	70	97	95	91	100	99	95			98		
cM capacity (veh/h)	223	240	554	203	238	744	1035			1260		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	101	24	49	301	20	533
Volume Left	66	18	49	0	20	0
Volume Right	29	5	0	11	0	20
cSH	270	243	1035	1700	1260	1700
Volume to Capacity	0.37	0.10	0.05	0.18	0.02	0.31
Queue Length 95th (ft)	41	8	4	0	1	0
Control Delay (s)	26.0	21.5	8.7	0.0	7.9	0.0
Lane LOS	D	C	A		A	
Approach Delay (s)	26.0	21.5	1.2		0.3	
Approach LOS	D	C				

Intersection Summary					
Average Delay	3.6				
Intersection Capacity Utilization	45.7%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	94	0	14	79	7	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.92	0.92	0.84	0.84
Hourly flow rate (vph)	112	0	15	86	8	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			112		228	112
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			112		228	112
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	98
cM capacity (veh/h)			1478		752	941

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	112	101	25
Volume Left	0	15	8
Volume Right	0	0	17
cSH	1700	1478	868
Volume to Capacity	0.07	0.01	0.03
Queue Length 95th (ft)	0	1	2
Control Delay (s)	0.0	1.2	9.3
Lane LOS		A	A
Approach Delay (s)	0.0	1.2	9.3
Approach LOS			A

Intersection Summary				
Average Delay			1.5	
Intersection Capacity Utilization			21.6%	ICU Level of Service A
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	141	0	14	106	17	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	157	0	16	118	19	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			157		306	157
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			157		306	157
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	98
cM capacity (veh/h)			1423		679	889

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	157	133	34
Volume Left	0	16	19
Volume Right	0	0	16
cSH	1700	1423	760
Volume to Capacity	0.09	0.01	0.05
Queue Length 95th (ft)	0	1	4
Control Delay (s)	0.0	1.0	10.0
Lane LOS		A	A
Approach Delay (s)	0.0	1.0	10.0
Approach LOS			A

Intersection Summary				
Average Delay			1.5	
Intersection Capacity Utilization			27.1%	ICU Level of Service A
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north)

4/14/2015

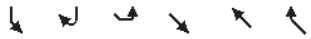
Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	17	0	0	72	29	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	20	0	0	86	35	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	126	40	45			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	126	40	45			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	869	1031	1563			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	20	86	45
Volume Left	20	0	0
Volume Right	0	0	11
cSH	869	1700	1700
Volume to Capacity	0.02	0.05	0.03
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	13.8%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north)

4/14/2015



Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	20	0	0	65	39	12
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	22	0	0	72	43	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	122	50	57			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	122	50	57			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	100	100			
cM capacity (veh/h)	873	1018	1548			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	22	72	57
Volume Left	22	0	0
Volume Right	0	0	13
cSH	873	1700	1700
Volume to Capacity	0.03	0.04	0.03
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	1.4			
Intersection Capacity Utilization	13.4%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west) 4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	94	72	0	86	29	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	112	86	0	102	35	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			198		257	155
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			198		257	155
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		95	100
cM capacity (veh/h)			1375		732	891

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	198	102	35
Volume Left	0	0	35
Volume Right	86	0	0
cSH	1700	1700	732
Volume to Capacity	0.12	0.06	0.05
Queue Length 95th (ft)	0	0	4
Control Delay (s)	0.0	0.0	10.2
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.2
Approach LOS			B

Intersection Summary				
Average Delay	1.0			
Intersection Capacity Utilization	19.3%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west) 4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	141	65	0	123	39	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	157	72	0	137	43	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			229		329	193
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			229		329	193
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		93	100
cM capacity (veh/h)			1339		665	849

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	229	137	43
Volume Left	0	0	43
Volume Right	72	0	0
cSH	1700	1700	665
Volume to Capacity	0.13	0.08	0.07
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.0	0.0	10.8
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.8
Approach LOS			B

Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	21.4%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	4	23	52	1	36	2	578	87	101	924	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	4	24	55	1	38	2	608	92	106	973	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1837	1891	974	1870	1846	654	975			700		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1837	1891	974	1870	1846	654	975			700		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	78	93	92	0	98	92	100			88		
cM capacity (veh/h)	48	62	306	44	66	467	708			897		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	39	94	2	700	106	975
Volume Left	11	55	2	0	106	0
Volume Right	24	38	0	92	0	2
cSH	106	69	708	1700	897	1700
Volume to Capacity	0.37	1.35	0.00	0.41	0.12	0.57
Queue Length 95th (ft)	37	191	0	0	10	0
Control Delay (s)	57.4	329.3	10.1	0.0	9.6	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	57.4	329.3	0.0		0.9	
Approach LOS	F	F				

Intersection Summary					
Average Delay	17.8				
Intersection Capacity Utilization	72.3%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	21	0	33	60	1	66	7	856	104	83	977	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	22	0	34	62	1	68	7	882	107	86	1007	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2150	2189	1013	2163	2141	936	1020			990		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2150	2189	1013	2163	2141	936	1020			990		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	11	100	88	0	98	79	99			88		
cM capacity (veh/h)	24	40	290	27	42	321	681			698		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	56	131	7	990	86	1020
Volume Left	22	62	7	0	86	0
Volume Right	34	68	0	107	0	12
cSH	55	52	681	1700	698	1700
Volume to Capacity	1.01	2.52	0.01	0.58	0.12	0.60
Queue Length 95th (ft)	115	338	1	0	10	0
Control Delay (s)	244.8	858.6	10.3	0.0	10.9	0.0
Lane LOS	F	F	B		B	
Approach Delay (s)	244.8	858.6	0.1		0.8	
Approach LOS	F	F				

Intersection Summary					
Average Delay	55.5				
Intersection Capacity Utilization	76.4%	ICU Level of Service		D	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	58	1	63	28	1	6	22	380	1	6	938	41
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	62	1	68	30	1	6	24	409	1	6	1009	44
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1506	1501	1031	1546	1522	409	1053			410		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1506	1501	1031	1546	1522	409	1053			410		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	34	99	76	56	99	99	96			99		
cM capacity (veh/h)	95	117	283	68	113	642	661			1149		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	131	38	24	410	6	1053
Volume Left	62	30	24	0	6	0
Volume Right	68	6	0	1	0	44
cSH	145	82	661	1700	1149	1700
Volume to Capacity	0.91	0.46	0.04	0.24	0.01	0.62
Queue Length 95th (ft)	156	48	3	0	0	0
Control Delay (s)	112.1	82.3	10.6	0.0	8.2	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	112.1	82.3	0.6		0.0	
Approach LOS	F	F				

Intersection Summary					
Average Delay		10.9			
Intersection Capacity Utilization		65.5%	ICU Level of Service		C
Analysis Period (min)		15			

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	74	6	42	17	1	5	61	273	10	19	482	32
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	79	6	45	18	1	5	65	290	11	20	513	34
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	996	1001	530	1027	1013	296	547			301		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	996	1001	530	1027	1013	296	547			301		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	62	97	92	90	100	99	94			98		
cM capacity (veh/h)	208	224	549	180	220	744	1023			1260		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	130	24	65	301	20	547
Volume Left	79	18	65	0	20	0
Volume Right	45	5	0	11	0	34
cSH	265	217	1023	1700	1260	1700
Volume to Capacity	0.49	0.11	0.06	0.18	0.02	0.32
Queue Length 95th (ft)	63	9	5	0	1	0
Control Delay (s)	30.9	23.7	8.8	0.0	7.9	0.0
Lane LOS	D	C	A		A	
Approach Delay (s)	30.9	23.7	1.6		0.3	
Approach LOS	D	C				

Intersection Summary					
Average Delay		4.9			
Intersection Capacity Utilization		48.1%	ICU Level of Service		A
Analysis Period (min)		15			

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	94	0	14	79	7	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	94	0	14	79	7	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			94		201	94
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			94		201	94
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1500		780	963

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	94	93	21
Volume Left	0	14	7
Volume Right	0	0	14
cSH	1700	1500	893
Volume to Capacity	0.06	0.01	0.02
Queue Length 95th (ft)	0	1	2
Control Delay (s)	0.0	1.2	9.1
Lane LOS		A	A
Approach Delay (s)	0.0	1.2	9.1
Approach LOS			A

Intersection Summary				
Average Delay		1.4		
Intersection Capacity Utilization		21.6%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	141	0	14	106	17	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	141	0	14	106	17	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			141		275	141
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			141		275	141
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	98
cM capacity (veh/h)			1442		708	907

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	141	120	31
Volume Left	0	14	17
Volume Right	0	0	14
cSH	1700	1442	786
Volume to Capacity	0.08	0.01	0.04
Queue Length 95th (ft)	0	1	3
Control Delay (s)	0.0	0.9	9.8
Lane LOS		A	A
Approach Delay (s)	0.0	0.9	9.8
Approach LOS			A

Intersection Summary				
Average Delay		1.4		
Intersection Capacity Utilization		27.1%	ICU Level of Service	A
Analysis Period (min)		15		

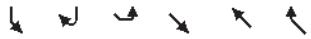
HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north) 4/14/2015

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	17	0	0	72	29	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	17	0	0	72	29	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	106	34	38			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	106	34	38			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	892	1040	1572			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	17	72	38
Volume Left	17	0	0
Volume Right	0	0	9
cSH	892	1700	1700
Volume to Capacity	0.02	0.04	0.02
Queue Length 95th (ft)	1	0	0
Control Delay (s)	9.1	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.1	0.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	13.8%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north) 4/14/2015



Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	20	0	0	65	39	12
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	20	0	0	65	39	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	110	45	51			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	110	45	51			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	887	1025	1555			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	20	65	51
Volume Left	20	0	0
Volume Right	0	0	12
cSH	887	1700	1700
Volume to Capacity	0.02	0.04	0.03
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	13.4%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west) 4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	94	72	0	86	29	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	94	72	0	86	29	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			166		216	130
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			166		216	130
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	100
cM capacity (veh/h)			1412		772	920

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	166	86	29
Volume Left	0	0	29
Volume Right	72	0	0
cSH	1700	1700	772
Volume to Capacity	0.10	0.05	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.0	0.0	9.8
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.8
Approach LOS			A

Intersection Summary			
Average Delay		1.0	
Intersection Capacity Utilization		19.3%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west) 4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	141	65	0	123	39	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	141	65	0	123	39	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			206		296	174
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			206		296	174
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		94	100
cM capacity (veh/h)			1365		695	870

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	206	123	39
Volume Left	0	0	39
Volume Right	65	0	0
cSH	1700	1700	695
Volume to Capacity	0.12	0.07	0.06
Queue Length 95th (ft)	0	0	4
Control Delay (s)	0.0	0.0	10.5
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.5
Approach LOS			B

Intersection Summary			
Average Delay		1.1	
Intersection Capacity Utilization		21.4%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	7	23	91	2	63	4	1012	135	161	1617	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	7	23	91	2	63	4	1012	135	161	1617	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3025	3096	1619	3053	3030	1080	1621			1147		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3025	3096	1619	3053	3030	1080	1621			1147		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	18	82	0	79	76	99			74		
cM capacity (veh/h)	4	9	127	2	9	265	401			609		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	30	156	4	1147	161	1621
Volume Left	0	91	4	0	161	0
Volume Right	23	63	0	135	0	4
cSH	30	3	401	1700	609	1700
Volume to Capacity	1.00	55.78	0.01	0.67	0.26	0.95
Queue Length 95th (ft)	84	Err	1	0	26	0
Control Delay (s)	357.0	Err	14.1	0.0	13.0	0.0
Lane LOS	F	F	B		B	
Approach Delay (s)	357.0	Err	0.0		1.2	
Approach LOS	F	F				

Intersection Summary					
Average Delay	504.2				
Intersection Capacity Utilization	114.3%	ICU Level of Service		H	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	14	0	32	105	2	116	12	1498	159	123	1710	21
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	14	0	32	105	2	116	12	1498	159	123	1710	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3606	3648	1720	3590	3578	1578	1731			1657		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3606	3648	1720	3590	3578	1578	1731			1657		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	71	0	46	14	97			68		
cM capacity (veh/h)	0	3	111	2	4	135	364			389		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	46	223	12	1657	123	1731
Volume Left	14	105	12	0	123	0
Volume Right	32	116	0	159	0	21
cSH	1	3	364	1700	389	1700
Volume to Capacity	77.66	66.98	0.03	0.97	0.32	1.02
Queue Length 95th (ft)	Err	Err	3	0	33	0
Control Delay (s)	Err	Err	15.2	0.0	18.5	0.0
Lane LOS	F	F	C		C	
Approach Delay (s)	Err	Err	0.1		1.2	
Approach LOS	F	F				

Intersection Summary					
Average Delay	710.0				
Intersection Capacity Utilization	125.0%	ICU Level of Service		H	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	49	0	76	10	3	5	49	585	0	1	1467	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	49	0	76	10	3	5	49	585	0	1	1467	40
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2178	2172	1487	2228	2192	585	1507			585		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2178	2172	1487	2228	2192	585	1507			585		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	50	29	93	99	89			100		
cM capacity (veh/h)	28	41	153	14	40	511	444			990		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	125	18	49	585	1	1507
Volume Left	49	10	49	0	1	0
Volume Right	76	5	0	0	0	40
cSH	56	23	444	1700	990	1700
Volume to Capacity	2.22	0.79	0.11	0.34	0.00	0.89
Queue Length 95th (ft)	309	58	9	0	0	0
Control Delay (s)	716.7	360.4	14.1	0.0	8.6	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	716.7	360.4	1.1		0.0	
Approach LOS	F	F				

Intersection Summary					
Average Delay		42.4			
Intersection Capacity Utilization	94.5%	ICU Level of Service	F		
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	78	2	69	16	1	8	54	763	7	18	981	49
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	78	2	69	16	1	8	54	763	7	18	981	49
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1921	1920	1006	1962	1940	766	1030			770		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1921	1920	1006	1962	1940	766	1030			770		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	97	76	51	98	98	92			98		
cM capacity (veh/h)	45	61	293	33	59	402	674			844		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	149	25	54	770	18	1030
Volume Left	78	16	54	0	18	0
Volume Right	69	8	0	7	0	49
cSH	75	48	674	1700	844	1700
Volume to Capacity	1.99	0.53	0.08	0.45	0.02	0.61
Queue Length 95th (ft)	335	49	7	0	2	0
Control Delay (s)	579.0	145.2	10.8	0.0	9.4	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	579.0	145.2	0.7		0.2	
Approach LOS	F	F				

Intersection Summary					
Average Delay		44.3			
Intersection Capacity Utilization	70.9%	ICU Level of Service	C		
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	90	0	29	118	7	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.92	0.92	0.84	0.84
Hourly flow rate (vph)	107	0	32	128	8	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			107		298	107
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			107		298	107
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		99	98
cM capacity (veh/h)			1484		678	947

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	107	160	25
Volume Left	0	32	8
Volume Right	0	0	17
cSH	1700	1484	836
Volume to Capacity	0.06	0.02	0.03
Queue Length 95th (ft)	0	2	2
Control Delay (s)	0.0	1.6	9.4
Lane LOS		A	A
Approach Delay (s)	0.0	1.6	9.4
Approach LOS			A

Intersection Summary				
Average Delay	1.7			
Intersection Capacity Utilization	24.5%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	193	0	11	157	17	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	214	0	12	174	19	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			214		413	214
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			214		413	214
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	98
cM capacity (veh/h)			1356		590	826

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	214	187	33
Volume Left	0	12	19
Volume Right	0	0	14
cSH	1700	1356	673
Volume to Capacity	0.13	0.01	0.05
Queue Length 95th (ft)	0	1	4
Control Delay (s)	0.0	0.6	10.6
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	10.6
Approach LOS			B

Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	27.3%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north)

4/14/2015

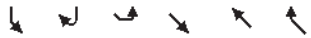
Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	32	0	0	77	29	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	38	0	0	92	35	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	132	40	45			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	132	40	45			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	100	100			
cM capacity (veh/h)	862	1031	1563			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	38	92	45
Volume Left	38	0	0
Volume Right	0	0	11
cSH	862	1700	1700
Volume to Capacity	0.04	0.05	0.03
Queue Length 95th (ft)	3	0	0
Control Delay (s)	9.4	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.4	0.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	2.0			
Intersection Capacity Utilization	14.1%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north)

4/14/2015



Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	17	0	0	66	39	11
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	19	0	0	73	43	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	123	49	56			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	123	49	56			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	872	1019	1549			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	19	73	56
Volume Left	19	0	0
Volume Right	0	0	12
cSH	872	1700	1700
Volume to Capacity	0.02	0.04	0.03
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	13.5%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	90	77	0	125	29	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	107	92	0	149	35	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			199		302	153
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			199		302	153
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		95	100
cM capacity (veh/h)			1374		690	893

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	199	149	35
Volume Left	0	0	35
Volume Right	92	0	0
cSH	1700	1700	690
Volume to Capacity	0.12	0.09	0.05
Queue Length 95th (ft)	0	0	4
Control Delay (s)	0.0	0.0	10.5
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.5
Approach LOS			B

Intersection Summary				
Average Delay		0.9		
Intersection Capacity Utilization		19.4%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	193	66	0	174	39	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	214	73	0	193	43	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			288		444	251
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			288		444	251
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		92	100
cM capacity (veh/h)			1274		571	788

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	288	193	43
Volume Left	0	0	43
Volume Right	73	0	0
cSH	1700	1700	571
Volume to Capacity	0.17	0.11	0.08
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.0	11.8
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.8
Approach LOS			B

Intersection Summary				
Average Delay		1.0		
Intersection Capacity Utilization		24.2%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	4	13	81	1	66	2	578	87	102	924	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	4	14	85	1	69	2	608	92	107	973	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1871	1893	974	1862	1848	654	975			700		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1871	1893	974	1862	1848	654	975			700		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	93	96	0	98	85	100			88		
cM capacity (veh/h)	42	61	306	46	65	467	708			897		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	18	156	2	700	107	975
Volume Left	0	85	2	0	107	0
Volume Right	14	69	0	92	0	2
cSH	158	77	708	1700	897	1700
Volume to Capacity	0.11	2.02	0.00	0.41	0.12	0.57
Queue Length 95th (ft)	9	350	0	0	10	0
Control Delay (s)	30.7	590.1	10.1	0.0	9.6	0.0
Lane LOS	D	F	B		A	
Approach Delay (s)	30.7	590.1	0.0		0.9	
Approach LOS	D	F				

Intersection Summary					
Average Delay	47.8				
Intersection Capacity Utilization	77.3%	ICU Level of Service		D	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	0	18	99	1	106	7	856	131	109	977	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	8	0	19	102	1	109	7	882	135	112	1007	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2245	2270	1013	2215	2209	950	1020			1018		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2245	2270	1013	2215	2209	950	1020			1018		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	50	100	94	0	97	65	99			84		
cM capacity (veh/h)	17	33	290	25	37	315	681			682		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	27	212	7	1018	112	1020
Volume Left	8	102	7	0	112	0
Volume Right	19	109	0	135	0	12
cSH	48	48	681	1700	682	1700
Volume to Capacity	0.56	4.39	0.01	0.60	0.16	0.60
Queue Length 95th (ft)	53	Err	1	0	15	0
Control Delay (s)	152.1	Err	10.3	0.0	11.3	0.0
Lane LOS	F	F	B		B	
Approach Delay (s)	152.1	Err	0.1		1.1	
Approach LOS	F	F				

Intersection Summary					
Average Delay	888.6				
Intersection Capacity Utilization	87.7%	ICU Level of Service		E	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	61	1	66	28	1	6	17	380	1	6	938	36
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	66	1	71	30	1	6	18	409	1	6	1009	39
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1493	1487	1028	1539	1506	409	1047			410		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1493	1487	1028	1539	1506	409	1047			410		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	33	99	75	56	99	99	97			99		
cM capacity (veh/h)	97	120	284	69	117	642	664			1149		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	138	38	18	410	6	1047
Volume Left	66	30	18	0	6	0
Volume Right	71	6	0	1	0	39
cSH	148	82	664	1700	1149	1700
Volume to Capacity	0.93	0.46	0.03	0.24	0.01	0.62
Queue Length 95th (ft)	165	47	2	0	0	0
Control Delay (s)	116.6	81.6	10.6	0.0	8.2	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	116.6	81.6	0.5		0.0	
Approach LOS	F	F				

Intersection Summary					
Average Delay		11.7			
Intersection Capacity Utilization		65.5%	ICU Level of Service		C
Analysis Period (min)		15			

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	75	6	40	17	1	5	59	273	10	19	482	32
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	80	6	43	18	1	5	63	290	11	20	513	34
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	992	997	530	1020	1009	296	547			301		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	992	997	530	1020	1009	296	547			301		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	62	97	92	90	100	99	94			98		
cM capacity (veh/h)	209	225	549	183	222	744	1023			1260		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	129	24	63	301	20	547
Volume Left	80	18	63	0	20	0
Volume Right	43	5	0	11	0	34
cSH	264	221	1023	1700	1260	1700
Volume to Capacity	0.49	0.11	0.06	0.18	0.02	0.32
Queue Length 95th (ft)	62	9	5	0	1	0
Control Delay (s)	30.9	23.3	8.8	0.0	7.9	0.0
Lane LOS	D	C	A		A	
Approach Delay (s)	30.9	23.3	1.5		0.3	
Approach LOS	D	C				

Intersection Summary					
Average Delay		4.9			
Intersection Capacity Utilization		48.0%	ICU Level of Service		A
Analysis Period (min)		15			

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	109	0	30	138	7	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.92	0.92	0.84	0.84
Hourly flow rate (vph)	130	0	33	150	8	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			130		345	130
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			130		345	130
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		99	98
cM capacity (veh/h)			1456		637	920

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	130	183	25
Volume Left	0	33	8
Volume Right	0	0	17
cSH	1700	1456	801
Volume to Capacity	0.08	0.02	0.03
Queue Length 95th (ft)	0	2	2
Control Delay (s)	0.0	1.5	9.6
Lane LOS		A	A
Approach Delay (s)	0.0	1.5	9.6
Approach LOS			A

Intersection Summary				
Average Delay			1.5	
Intersection Capacity Utilization			25.6%	ICU Level of Service A
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	219	0	14	185	17	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	243	0	16	206	19	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			243		480	243
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			243		480	243
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		96	98
cM capacity (veh/h)			1323		538	795

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	243	221	34
Volume Left	0	16	19
Volume Right	0	0	16
cSH	1700	1323	630
Volume to Capacity	0.14	0.01	0.05
Queue Length 95th (ft)	0	1	4
Control Delay (s)	0.0	0.6	11.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	11.0
Approach LOS			B

Intersection Summary				
Average Delay			1.0	
Intersection Capacity Utilization			31.3%	ICU Level of Service A
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north)

4/14/2015

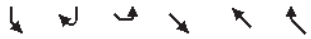
Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	33	0	0	77	29	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	39	0	0	92	35	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	132	40	45			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	132	40	45			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	100	100			
cM capacity (veh/h)	862	1031	1563			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	39	92	45
Volume Left	39	0	0
Volume Right	0	0	11
cSH	862	1700	1700
Volume to Capacity	0.05	0.05	0.03
Queue Length 95th (ft)	4	0	0
Control Delay (s)	9.4	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.4	0.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	14.1%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north)

4/14/2015



Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	20	0	0	66	39	12
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	22	0	0	73	43	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	123	50	57			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	123	50	57			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	100	100			
cM capacity (veh/h)	872	1018	1548			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	22	73	57
Volume Left	22	0	0
Volume Right	0	0	13
cSH	872	1700	1700
Volume to Capacity	0.03	0.04	0.03
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	13.5%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west) 4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	109	77	0	145	29	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	130	92	0	173	35	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			221		348	176
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			221		348	176
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		95	100
cM capacity (veh/h)			1348		649	868

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	221	173	35
Volume Left	0	0	35
Volume Right	92	0	0
cSH	1700	1700	649
Volume to Capacity	0.13	0.10	0.05
Queue Length 95th (ft)	0	0	4
Control Delay (s)	0.0	0.0	10.9
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.9
Approach LOS			B

Intersection Summary				
Average Delay		0.9		
Intersection Capacity Utilization		20.4%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west) 4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	219	66	0	202	39	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	243	73	0	224	43	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			317		504	280
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			317		504	280
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		92	100
cM capacity (veh/h)			1243		527	759

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	317	224	43
Volume Left	0	0	43
Volume Right	73	0	0
cSH	1700	1700	527
Volume to Capacity	0.19	0.13	0.08
Queue Length 95th (ft)	0	0	7
Control Delay (s)	0.0	0.0	12.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	12.4
Approach LOS			B

Intersection Summary				
Average Delay		0.9		
Intersection Capacity Utilization		25.5%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	4	23	81	1	66	2	578	97	111	924	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	4	24	85	1	69	2	608	102	117	973	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1890	1922	974	1896	1872	659	975			711		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1890	1922	974	1896	1872	659	975			711		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	74	93	92	0	98	85	100			87		
cM capacity (veh/h)	40	58	306	41	62	463	708			889		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	39	156	2	711	117	975
Volume Left	11	85	2	0	117	0
Volume Right	24	69	0	102	0	2
cSH	94	70	708	1700	889	1700
Volume to Capacity	0.41	2.23	0.00	0.42	0.13	0.57
Queue Length 95th (ft)	42	368	0	0	11	0
Control Delay (s)	67.9	692.1	10.1	0.0	9.7	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	67.9	692.1	0.0		1.0	
Approach LOS	F	F				

Intersection Summary					
Average Delay	55.8				
Intersection Capacity Utilization	77.3%	ICU Level of Service		D	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	21	0	33	99	1	106	7	856	144	122	977	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	22	0	34	102	1	109	7	882	148	126	1007	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2272	2310	1013	2264	2242	957	1020			1031		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2272	2310	1013	2264	2242	957	1020			1031		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	88	0	97	65	99			81		
cM capacity (veh/h)	15	31	290	22	34	313	681			674		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	56	212	7	1031	126	1020
Volume Left	22	102	7	0	126	0
Volume Right	34	109	0	148	0	12
cSH	37	42	681	1700	674	1700
Volume to Capacity	1.52	5.09	0.01	0.61	0.19	0.60
Queue Length 95th (ft)	148	Err	1	0	17	0
Control Delay (s)	506.1	Err	10.3	0.0	11.6	0.0
Lane LOS	F	F	B		B	
Approach Delay (s)	506.1	Err	0.1		1.3	
Approach LOS	F	F				

Intersection Summary					
Average Delay	878.3				
Intersection Capacity Utilization	87.6%	ICU Level of Service		E	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	70	1	76	28	1	6	26	380	1	6	938	45
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	75	1	82	30	1	6	28	409	1	6	1009	48
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1517	1511	1033	1569	1535	409	1057			410		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1517	1511	1033	1569	1535	409	1057			410		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	19	99	71	51	99	99	96			99		
cM capacity (veh/h)	92	114	282	61	111	642	659			1149		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	158	38	28	410	6	1057
Volume Left	75	30	28	0	6	0
Volume Right	82	6	0	1	0	48
cSH	142	73	659	1700	1149	1700
Volume to Capacity	1.11	0.51	0.04	0.24	0.01	0.62
Queue Length 95th (ft)	219	53	3	0	0	0
Control Delay (s)	171.2	97.1	10.7	0.0	8.2	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	171.2	97.1	0.7		0.0	
Approach LOS	F	F				

Intersection Summary					
Average Delay	18.3				
Intersection Capacity Utilization	67.2%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	87	6	55	17	1	5	74	273	10	19	482	45
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	93	6	59	18	1	5	79	290	11	20	513	48
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1031	1036	537	1068	1054	296	561			301		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1031	1036	537	1068	1054	296	561			301		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	52	97	89	89	99	99	92			98		
cM capacity (veh/h)	194	210	544	162	205	744	1011			1260		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	157	24	79	301	20	561
Volume Left	93	18	79	0	20	0
Volume Right	59	5	0	11	0	48
cSH	256	197	1011	1700	1260	1700
Volume to Capacity	0.61	0.12	0.08	0.18	0.02	0.33
Queue Length 95th (ft)	92	10	6	0	1	0
Control Delay (s)	39.1	25.9	8.9	0.0	7.9	0.0
Lane LOS	E	D	A		A	
Approach Delay (s)	39.1	25.9	1.8		0.3	
Approach LOS	E	D				

Intersection Summary					
Average Delay	6.7				
Intersection Capacity Utilization	51.2%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	109	0	30	138	7	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	109	0	30	138	7	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			109		307	109
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			109		307	109
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		99	99
cM capacity (veh/h)			1481		671	945

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	109	168	21
Volume Left	0	30	7
Volume Right	0	0	14
cSH	1700	1481	832
Volume to Capacity	0.06	0.02	0.03
Queue Length 95th (ft)	0	2	2
Control Delay (s)	0.0	1.5	9.4
Lane LOS		A	A
Approach Delay (s)	0.0	1.5	9.4
Approach LOS			A

Intersection Summary				
Average Delay			1.5	
Intersection Capacity Utilization			25.6%	ICU Level of Service A
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
1: SR 128 & Conn Creek Road (north)

4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	219	0	14	185	17	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	219	0	14	185	17	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			219		432	219
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			219		432	219
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	98
cM capacity (veh/h)			1350		575	821

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	219	199	31
Volume Left	0	14	17
Volume Right	0	0	14
cSH	1700	1350	665
Volume to Capacity	0.13	0.01	0.05
Queue Length 95th (ft)	0	1	4
Control Delay (s)	0.0	0.6	10.7
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	10.7
Approach LOS			B

Intersection Summary				
Average Delay			1.0	
Intersection Capacity Utilization			31.3%	ICU Level of Service A
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north)

4/14/2015

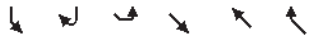
Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	33	0	0	77	29	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	33	0	0	77	29	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	110	34	38			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	110	34	38			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	100	100			
cM capacity (veh/h)	886	1040	1572			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	33	77	38
Volume Left	33	0	0
Volume Right	0	0	9
cSH	886	1700	1700
Volume to Capacity	0.04	0.05	0.02
Queue Length 95th (ft)	3	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	14.1%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Conn Creek Road (south)/Conn Creek Road (west) & Conn Creek Road (north)

4/14/2015



Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	20	0	0	66	39	12
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	20	0	0	66	39	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	111	45	51			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	111	45	51			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	886	1025	1555			

Direction, Lane #	SB 1	SE 1	NW 1
Volume Total	20	66	51
Volume Left	20	0	0
Volume Right	0	0	12
cSH	886	1700	1700
Volume to Capacity	0.02	0.04	0.03
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	13.5%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west) 4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	109	77	0	145	29	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	109	77	0	145	29	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			186		292	148
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			186		292	148
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	100
cM capacity (veh/h)			1388		698	899

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	186	145	29
Volume Left	0	0	29
Volume Right	77	0	0
cSH	1700	1700	698
Volume to Capacity	0.11	0.09	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.0	0.0	10.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.4
Approach LOS			B

Intersection Summary				
Average Delay		0.8		
Intersection Capacity Utilization		20.4%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
3: SR 128-Rutherford Rd/SR 128 & Conn Creek Road (west) 4/14/2015

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	219	66	0	202	39	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	219	66	0	202	39	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			285		454	252
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			285		454	252
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		93	100
cM capacity (veh/h)			1277		564	787

Direction, Lane #	NB 1	SB 1	NW 1
Volume Total	285	202	39
Volume Left	0	0	39
Volume Right	66	0	0
cSH	1700	1700	564
Volume to Capacity	0.17	0.12	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.0	11.9
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.9
Approach LOS			B

Intersection Summary				
Average Delay		0.9		
Intersection Capacity Utilization		25.5%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	7	23	120	2	93	4	1012	145	171	1617	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	7	23	120	2	93	4	1012	145	171	1617	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3075	3126	1619	3078	3056	1084	1621			1157		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3075	3126	1619	3078	3056	1084	1621			1157		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	12	82	0	77	65	99			72		
cM capacity (veh/h)	3	8	127	1	9	263	401			604		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	30	215	4	1157	171	1621
Volume Left	0	120	4	0	171	0
Volume Right	23	93	0	145	0	4
cSH	28	2	401	1700	604	1700
Volume to Capacity	1.06	98.65	0.01	0.68	0.28	0.95
Queue Length 95th (ft)	87	Err	1	0	29	0
Control Delay (s)	392.6	Err	14.1	0.0	13.3	0.0
Lane LOS	F	F	B		B	
Approach Delay (s)	392.6	Err	0.0		1.3	
Approach LOS	F	F				

Intersection Summary					
Average Delay	676.6				
Intersection Capacity Utilization	117.8%	ICU Level of Service		H	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	14	0	32	144	2	156	12	1498	199	162	1710	21
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	14	0	32	144	2	156	12	1498	199	162	1710	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3724	3766	1720	3688	3676	1598	1731			1697		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3724	3766	1720	3688	3676	1598	1731			1697		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	71	0	24	0	97			57		
cM capacity (veh/h)	0	2	111	1	3	131	364			375		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	46	302	12	1697	162	1731
Volume Left	14	144	12	0	162	0
Volume Right	32	156	0	199	0	21
cSH	0	2	364	1700	375	1700
Volume to Capacity	Err	123.32	0.03	1.00	0.43	1.02
Queue Length 95th (ft)	Err	Err	3	0	53	0
Control Delay (s)	Err	Err	15.2	0.0	21.7	0.0
Lane LOS	F	F	C		C	
Approach Delay (s)	Err	Err	0.1		1.9	
Approach LOS	F	F				

Intersection Summary					
Average Delay	Err				
Intersection Capacity Utilization	134.2%	ICU Level of Service		H	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	61	0	89	10	3	5	53	585	0	1	1467	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	61	0	89	10	3	5	53	585	0	1	1467	44
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2188	2182	1489	2249	2204	585	1511			585		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2188	2182	1489	2249	2204	585	1511			585		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	42	10	92	99	88			100		
cM capacity (veh/h)	28	40	152	11	39	511	443			990		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	150	18	53	585	1	1511
Volume Left	61	10	53	0	1	0
Volume Right	89	5	0	0	0	44
cSH	54	18	443	1700	990	1700
Volume to Capacity	2.79	0.98	0.12	0.34	0.00	0.89
Queue Length 95th (ft)	391	64	10	0	0	0
Control Delay (s)	968.8	492.2	14.2	0.0	8.6	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	968.8	492.2	1.2		0.0	
Approach LOS	F	F				

Intersection Summary					
Average Delay		66.8			
Intersection Capacity Utilization	96.4%	ICU Level of Service		F	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/14/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	91	2	82	16	1	8	67	763	7	18	981	62
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	91	2	82	16	1	8	67	763	7	18	981	62
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1954	1952	1012	2000	1980	766	1043			770		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1954	1952	1012	2000	1980	766	1043			770		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	96	72	43	98	98	90			98		
cM capacity (veh/h)	42	56	290	28	54	402	667			844		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	175	25	67	770	18	1043
Volume Left	91	16	67	0	18	0
Volume Right	82	8	0	7	0	62
cSH	71	41	667	1700	844	1700
Volume to Capacity	2.47	0.60	0.10	0.45	0.02	0.61
Queue Length 95th (ft)	423	55	8	0	2	0
Control Delay (s)	794.1	180.5	11.0	0.0	9.4	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	794.1	180.5	0.9		0.2	
Approach LOS	F	F				

Intersection Summary					
Average Delay		68.8			
Intersection Capacity Utilization	73.6%	ICU Level of Service		D	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/17/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	4	13	81	1	66	2	578	87	102	924	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.90			1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		1.00			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1667			1775	1583	1770	1826		1770	1862	
Flt Permitted		1.00			0.95	1.00	0.20	1.00		0.95	1.00	
Satd. Flow (perm)		1667			1775	1583	371	1826		1770	1862	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	4	14	85	1	69	2	608	92	107	973	2
RTOR Reduction (vph)	0	14	0	0	0	62	0	8	0	0	0	0
Lane Group Flow (vph)	0	4	0	0	86	7	2	692	0	107	975	0
Turn Type		NA		Split	NA	Perm	Perm	NA		Prot	NA	
Protected Phases		4		8	8			2		1	6	
Permitted Phases	4					8	2					
Actuated Green, G (s)		1.2			5.7	5.7	29.2	29.2		4.0	37.2	
Effective Green, g (s)		1.2			5.7	5.7	29.2	29.2		4.0	37.2	
Actuated g/C Ratio		0.02			0.10	0.10	0.52	0.52		0.07	0.66	
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		35			180	160	193	950		126	1234	
v/s Ratio Prot		c0.00			c0.05			0.38		0.06	c0.52	
v/s Ratio Perm						0.00	0.01					
v/c Ratio		0.12			0.48	0.04	0.01	0.73		0.85	0.79	
Uniform Delay, d1		26.9			23.8	22.7	6.5	10.4		25.8	6.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6			2.0	0.1	0.1	4.9		38.3	5.2	
Delay (s)		28.5			25.8	22.9	6.6	15.3		64.0	11.9	
Level of Service		C			C	C	A	B		E	B	
Approach Delay (s)		28.5			24.5			15.3			17.0	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.80			
Actuated Cycle Length (s)	56.1	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	75.8%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/17/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	0	18	99	1	106	7	856	131	109	977	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.91			1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.99			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1661			1775	1583	1770	1826		1770	1859	
Flt Permitted		0.99			0.95	1.00	0.21	1.00		0.95	1.00	
Satd. Flow (perm)		1661			1775	1583	395	1826		1770	1859	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	8	0	19	102	1	109	7	882	135	112	1007	12
RTOR Reduction (vph)	0	26	0	0	0	100	0	6	0	0	1	0
Lane Group Flow (vph)	0	1	0	0	103	9	7	1011	0	112	1018	0
Turn Type	Split	NA		Split	NA	Perm	Perm	NA		Prot	NA	
Protected Phases	4	4		8	8			2		1	6	
Permitted Phases						8	2					
Actuated Green, G (s)		2.5			7.1	7.1	49.8	49.8		6.1	59.9	
Effective Green, g (s)		2.5			7.1	7.1	49.8	49.8		6.1	59.9	
Actuated g/C Ratio		0.03			0.09	0.09	0.61	0.61		0.07	0.73	
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		50			154	137	241	1115		132	1366	
v/s Ratio Prot		c0.00			c0.06			c0.55		0.06	c0.55	
v/s Ratio Perm						0.01	0.02					
v/c Ratio		0.02			0.67	0.07	0.03	0.91		0.85	0.75	
Uniform Delay, d1		38.3			36.1	34.2	6.3	13.8		37.2	6.3	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			10.5	0.2	0.0	10.5		36.9	2.3	
Delay (s)		38.4			46.6	34.4	6.3	24.4		74.1	8.6	
Level of Service		D			D	C	A	C		E	A	
Approach Delay (s)		38.4			40.3			24.3			15.1	
Approach LOS		D			D			C			B	

Intersection Summary				
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	81.5	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	81.2%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/17/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	4	23	81	1	66	2	578	97	111	924	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.92			1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.99			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1684			1775	1583	1770	1823		1770	1862	
Flt Permitted		0.99			0.95	1.00	0.18	1.00		0.95	1.00	
Satd. Flow (perm)		1684			1775	1583	336	1823		1770	1862	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	4	24	85	1	69	2	608	102	117	973	2
RTOR Reduction (vph)	0	23	0	0	0	62	0	9	0	0	0	0
Lane Group Flow (vph)	0	16	0	0	86	7	2	702	0	117	975	0
Turn Type	Split	NA		Split	NA	Perm	Perm	NA		Prot	NA	
Protected Phases	4	4		8	8			2		1	6	
Permitted Phases						8	2					
Actuated Green, G (s)		2.3			5.3	5.3	27.4	27.4		3.8	35.2	
Effective Green, g (s)		2.3			5.3	5.3	27.4	27.4		3.8	35.2	
Actuated g/C Ratio		0.04			0.10	0.10	0.50	0.50		0.07	0.64	
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		70			171	153	168	911		122	1196	
v/s Ratio Prot		c0.01			c0.05			0.38		0.07	c0.52	
v/s Ratio Perm						0.00	0.01					
v/c Ratio		0.23			0.50	0.04	0.01	0.77		0.96	0.82	
Uniform Delay, d1		25.4			23.5	22.5	6.9	11.1		25.4	7.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.7			2.3	0.1	0.0	4.1		67.9	4.4	
Delay (s)		27.1			25.8	22.6	6.9	15.2		93.3	11.7	
Level of Service		C			C	C	A	B		F	B	
Approach Delay (s)		27.1			24.4			15.2			20.5	
Approach LOS		C			C			B			C	

Intersection Summary				
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.82			
Actuated Cycle Length (s)	54.8	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	75.8%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/17/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	0	33	99	1	106	7	856	144	122	977	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.92			1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1677			1775	1583	1770	1823		1770	1859	
Flt Permitted		0.98			0.95	1.00	0.20	1.00		0.95	1.00	
Satd. Flow (perm)		1677			1775	1583	375	1823		1770	1859	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	22	0	34	102	1	109	7	882	148	126	1007	12
RTOR Reduction (vph)	0	53	0	0	0	100	0	6	0	0	1	0
Lane Group Flow (vph)	0	3	0	0	103	9	7	1024	0	126	1018	0
Turn Type	Split	NA		Split	NA	Perm	Perm	NA		Prot	NA	
Protected Phases	4	4		8	8			2		1	6	
Permitted Phases						8	2					
Actuated Green, G (s)		5.4			7.0	7.0	52.6	52.6		7.0	63.6	
Effective Green, g (s)		5.4			7.0	7.0	52.6	52.6		7.0	63.6	
Actuated g/C Ratio		0.06			0.08	0.08	0.60	0.60		0.08	0.72	
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		102			141	125	224	1089		140	1343	
v/s Ratio Prot		c0.00			c0.06			c0.56		0.07	c0.55	
v/s Ratio Perm						0.01	0.02					
v/c Ratio		0.03			0.73	0.07	0.03	0.94		0.90	0.76	
Uniform Delay, d1		38.8			39.6	37.5	7.3	16.2		40.2	7.5	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			17.6	0.2	0.1	14.8		47.4	2.5	
Delay (s)		39.0			57.2	37.7	7.3	31.1		87.5	10.0	
Level of Service		D			E	D	A	C		F	A	
Approach Delay (s)		39.0			47.2			30.9			18.5	
Approach LOS		D			D			C			B	

Intersection Summary				
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	88.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	82.6%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/17/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	7	23	120	2	93	4	1012	145	171	1617	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.90			1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		1.00			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1670			1775	1583	1770	1828		1770	1862	
Flt Permitted		1.00			0.95	1.00	0.04	1.00		0.95	1.00	
Satd. Flow (perm)		1670			1775	1583	77	1828		1770	1862	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	7	23	120	2	93	4	1012	145	171	1617	4
RTOR Reduction (vph)	0	22	0	0	0	86	0	3	0	0	0	0
Lane Group Flow (vph)	0	8	0	0	122	7	4	1154	0	171	1621	0
Turn Type		NA		Split	NA	Perm	Perm	NA		Prot	NA	
Protected Phases		4		8	8			2		1	6	
Permitted Phases	4					8	2					
Actuated Green, G (s)		6.3			11.0	11.0	97.3	97.3		15.0	116.3	
Effective Green, g (s)		6.3			11.0	11.0	97.3	97.3		15.0	116.3	
Actuated g/C Ratio		0.04			0.08	0.08	0.67	0.67		0.10	0.80	
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		72			134	119	51	1221		182	1487	
v/s Ratio Prot		c0.00			c0.07			0.63		0.10	c0.87	
v/s Ratio Perm						0.00	0.05					
v/c Ratio		0.11			0.91	0.06	0.08	0.94		0.94	1.09	
Uniform Delay, d1		67.0			66.8	62.5	8.5	21.7		64.8	14.6	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			51.4	0.2	0.7	14.4		48.8	52.0	
Delay (s)		67.6			118.2	62.7	9.1	36.2		113.7	66.6	
Level of Service		E			F	E	A	D		F	E	
Approach Delay (s)		67.6			94.2			36.1			71.1	
Approach LOS		E			F			D			E	

Intersection Summary				
HCM 2000 Control Delay	59.9	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	1.06			
Actuated Cycle Length (s)	145.6	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	117.9%	ICU Level of Service	H	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: SR 29 & SR 128-Rutherford Rd 4/17/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	0	32	144	2	156	12	1498	199	162	1710	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.91			1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.99			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1663			1775	1583	1770	1830		1770	1859	
Flt Permitted		0.99			0.95	1.00	0.04	1.00		0.95	1.00	
Satd. Flow (perm)		1663			1775	1583	80	1830		1770	1859	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	14	0	32	144	2	156	12	1498	199	162	1710	21
RTOR Reduction (vph)	0	43	0	0	0	140	0	3	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	146	16	12	1694	0	162	1731	0
Turn Type	Split	NA		Split	NA	Perm	Perm	NA		Prot	NA	
Protected Phases	4	4		8	8			2		1	6	
Permitted Phases						8	2					
Actuated Green, G (s)		8.6			14.8	14.8	93.4	93.4		9.0	106.4	
Effective Green, g (s)		8.6			14.8	14.8	93.4	93.4		9.0	106.4	
Actuated g/C Ratio		0.06			0.10	0.10	0.66	0.66		0.06	0.75	
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		100			185	165	52	1205		112	1394	
v/s Ratio Prot		c0.00			c0.08			c0.93		0.09	c0.93	
v/s Ratio Perm						0.01	0.15					
v/c Ratio		0.03			0.79	0.10	0.23	1.41		1.45	1.24	
Uniform Delay, d1		62.7			62.0	57.5	9.7	24.2		66.4	17.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			19.7	0.3	2.3	187.7		243.8	115.0	
Delay (s)		62.8			81.6	57.7	12.0	211.9		310.2	132.7	
Level of Service		E			F	E	B	F		F	F	
Approach Delay (s)		62.8			69.3			210.5			147.9	
Approach LOS		E			E			F			F	

Intersection Summary				
HCM 2000 Control Delay	168.0	HCM 2000 Level of Service	F	
HCM 2000 Volume to Capacity ratio	1.24			
Actuated Cycle Length (s)	141.8	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	125.2%	ICU Level of Service	H	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/17/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	0	89	10	3	5	53	585	0	1	1467	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.92			0.96		1.00	1.00		1.00	1.00	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1679			1744		1770	1863		1770	1855	
Flt Permitted		0.86			0.77		0.04	1.00		0.42	1.00	
Satd. Flow (perm)		1473			1380		75	1863		778	1855	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	61	0	89	10	3	5	53	585	0	1	1467	44
RTOR Reduction (vph)	0	46	0	0	4	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	104	0	0	14	0	53	585	0	1	1510	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		12.6			12.6		99.4	99.4		99.4	99.4	
Effective Green, g (s)		12.6			12.6		99.4	99.4		99.4	99.4	
Actuated g/C Ratio		0.10			0.10		0.83	0.83		0.83	0.83	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		154			144		62	1543		644	1536	
v/s Ratio Prot								0.31			c0.81	
v/s Ratio Perm		c0.07			0.01		0.71			0.00		
v/c Ratio		0.68			0.09		0.85	0.38		0.00	0.98	
Uniform Delay, d1		51.7			48.5		6.1	2.6		1.8	9.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		11.2			0.3		65.1	0.2		0.0	19.0	
Delay (s)		63.0			48.8		71.1	2.7		1.8	28.5	
Level of Service		E			D		E	A		A	C	
Approach Delay (s)		63.0			48.8			8.4			28.5	
Approach LOS		E			D			A			C	

Intersection Summary				
HCM 2000 Control Delay	25.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	96.4%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Silverado Trail & SR 128

4/17/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	91	2	82	16	1	8	67	763	7	18	981	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.94			0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.97			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1701			1727		1770	1860		1770	1846	
Flt Permitted		0.82			0.82		0.15	1.00		0.30	1.00	
Satd. Flow (perm)		1437			1456		283	1860		550	1846	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	91	2	82	16	1	8	67	763	7	18	981	62
RTOR Reduction (vph)	0	61	0	0	7	0	0	0	0	0	3	0
Lane Group Flow (vph)	0	114	0	0	18	0	67	770	0	18	1040	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.0			8.0		38.0	38.0		38.0	38.0	
Effective Green, g (s)		8.0			8.0		38.0	38.0		38.0	38.0	
Actuated g/C Ratio		0.15			0.15		0.70	0.70		0.70	0.70	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		212			215		199	1308		387	1299	
v/s Ratio Prot								0.41			c0.56	
v/s Ratio Perm		c0.08			0.01		0.24			0.03		
v/c Ratio		0.54			0.08		0.34	0.59		0.05	0.80	
Uniform Delay, d1		21.3			19.8		3.1	4.0		2.5	5.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.6			0.2		1.0	0.7		0.0	3.6	
Delay (s)		23.9			20.0		4.1	4.7		2.5	9.1	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		23.9			20.0			4.7			9.0	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.75			
Actuated Cycle Length (s)	54.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	73.6%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Appendix C

County of Napa
Winery Traffic Information/Trip Generation Sheet

Winery Traffic Information / Trip Generation Sheet

Project Name: Caymus Vineyards

Project Scenario: Permitted Conditions

Traffic during a Typical Weekday

Number of FT employees: 17 x 3.05 one-way trips per employee = 52 daily trips.

Number of PT employees: 0 x 1.90 one-way trips per employee = 0 daily trips.

Average number of weekday visitors: 75 / 2.6 visitors per vehicle x 2 one-way trips = 58 daily trips.

Gallons of production: 110000 / 1,000 x .009 truck trips daily[3] x 2 one-way trips = 2 daily trips.

Total = 112 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38) = 40 **PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays): 17 x 3.05 one-way trips per employee = 52 daily trips.

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

Average number of Saturday visitors: 75 / 2. 8 visitors per vehicle x 2 one-way trips = 54 daily trips.

Total = 105 **daily trips.**

(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57) = 48 **PM peak trips.**

Traffic during a Crush Saturday

Number of FT employees (during crush): 17 x 3.05 one-way trips per employee = 52 daily trips.

Number of PT employees (during crush): 0 x 1.90 one-way trips per employee = 0 daily trips.

Average number of Saturday visitors: 75 / 2. 8 visitors per vehicle x 2 one-way trips = 54 daily trips.

Gallons of production: 110000 / 1,000 x .009 truck trips daily x 2 one-way trips = 2 daily trips.

Avg. annual tons of grape on-haul: 550 / 144 truck trips daily [4] x 2 one-way trips = 8 daily trips.

Total = 115 **daily trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event): 12 x 2 one-way trips per staff person = 24 trips.

Number of visitors (largest event): 1800 / 2.8 visitors per vehicle x 2 one-way trips = 1286 trips.

Number of special event truck trips (largest event): 4 x 2 one-way trips = 8 trips.

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

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

Winery Traffic Information / Trip Generation Sheet

Project Name: Caymus Vineyards

Project Scenario: Existing Conditions

Traffic during a Typical Weekday

Number of FT employees:	42	x 3.05 one-way trips per employee	=	128 daily trips.
Number of PT employees:	14	x 1.90 one-way trips per employee	=	27 daily trips.
Average number of weekday visitors:	208	/ 2.6 visitors per vehicle x 2 one-way trips	=	160 daily trips.
Gallons of production:	2250000	/ 1,000 x .009 truck trips daily[3] x 2 one-way trips	=	41 daily trips.
		Total	=	355 **daily trips.**
(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38)			=	125 **PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays):	7	x 3.05 one-way trips per employee	=	21 daily trips.
Number of PT employees (on Saturdays):	4	x 1.90 one-way trips per employee	=	8 daily trips.
Average number of Saturday visitors:	312	/ 2. 8 visitors per vehicle x 2 one-way trips	=	223 daily trips.
		Total	=	252 **daily trips.**
(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57)			=	136 **PM peak trips.**

Traffic during a Crush Saturday

Number of FT employees (during crush):	14	x 3.05 one-way trips per employee	=	43 daily trips.
Number of PT employees (during crush):	7	x 1.90 one-way trips per employee	=	13 daily trips.
Average number of Saturday visitors:	450	/ 2. 8 visitors per vehicle x 2 one-way trips	=	321 daily trips.
Gallons of production:	2250000	/ 1,000 x .009 truck trips daily x 2 one-way trips	=	41 daily trips.
Avg. annual tons of grape on-haul:	8800	/ 144 truck trips daily[4] x 2 one-way trips	=	122 daily trips.
		Total	=	540 **daily trips.**

Largest Marketing Event- Additional Traffic

Number of event staff (largest event):	20	x 2 one-way trips per staff person	=	40 trips.
Number of visitors (largest event):	250	/ 2.8 visitors per vehicle x 2 one-way trips	=	179 trips.
Number of special event truck trips (largest event):	4	x 2 one-way trips	=	8 trips.

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

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

Winery Traffic Information / Trip Generation Sheet

Project Name: Caymus Vineyards Project Scenario: Proposed Conditions

Traffic during a Typical Weekday

Number of FT employees:	50	x 3.05 one-way trips per employee	=	153 daily trips.
Number of PT employees:	14	x 1.90 one-way trips per employee	=	27 daily trips.
Average number of weekday visitors:	346	/ 2.6 visitors per vehicle x 2 one-way trips	=	266 daily trips.
Gallons of production:	1800000	/ 1,000 x .009 truck trips daily[3] x 2 one-way trips	=	32 daily trips.
		Total	=	478 **daily trips.**
(№ of FT employees) + (№ of PT employees/2) + (sum of visitor and truck trips x .38)			=	170 **PM peak trips.**

Traffic during a Typical Saturday

Number of FT employees (on Saturdays):	15	x 3.05 one-way trips per employee	=	46 daily trips.
Number of PT employees (on Saturdays):	7	x 1.90 one-way trips per employee	=	13 daily trips.
Average number of Saturday visitors:	589	/ 2. 8 visitors per vehicle x 2 one-way trips	=	421 daily trips.
		Total	=	480 **daily trips.**
(№ of FT employees) + (№ of PT employees/2) + (visitor trips x .57)			=	258 **PM peak trips.**

Traffic during a Crush Saturday

Number of FT employees (during crush):	22	x 3.05 one-way trips per employee	=	67 daily trips.
Number of PT employees (during crush):	10	x 1.90 one-way trips per employee	=	19 daily trips.
Average number of Saturday visitors:	850	/ 2. 8 visitors per vehicle x 2 one-way trips	=	607 daily trips.
Gallons of production:	1800000	/ 1,000 x .009 truck trips daily x 2 one-way trips	=	32 daily trips.
Avg. annual tons of grape on-haul:	8800	/ 144 truck trips daily[4] x 2 one-way trips	=	122 daily trips.
		Total	=	848 **daily trips.**

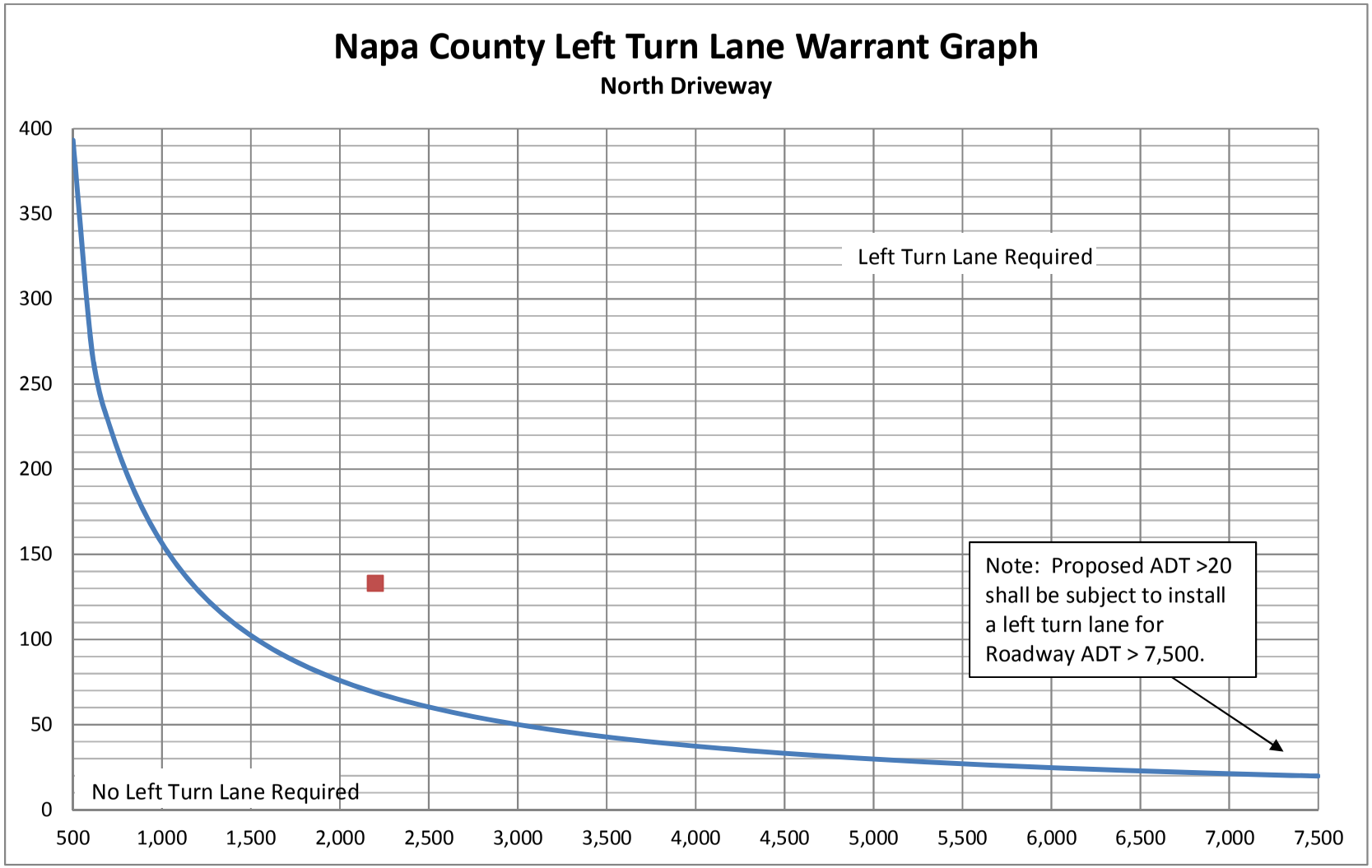
Largest Marketing Event- Additional Traffic

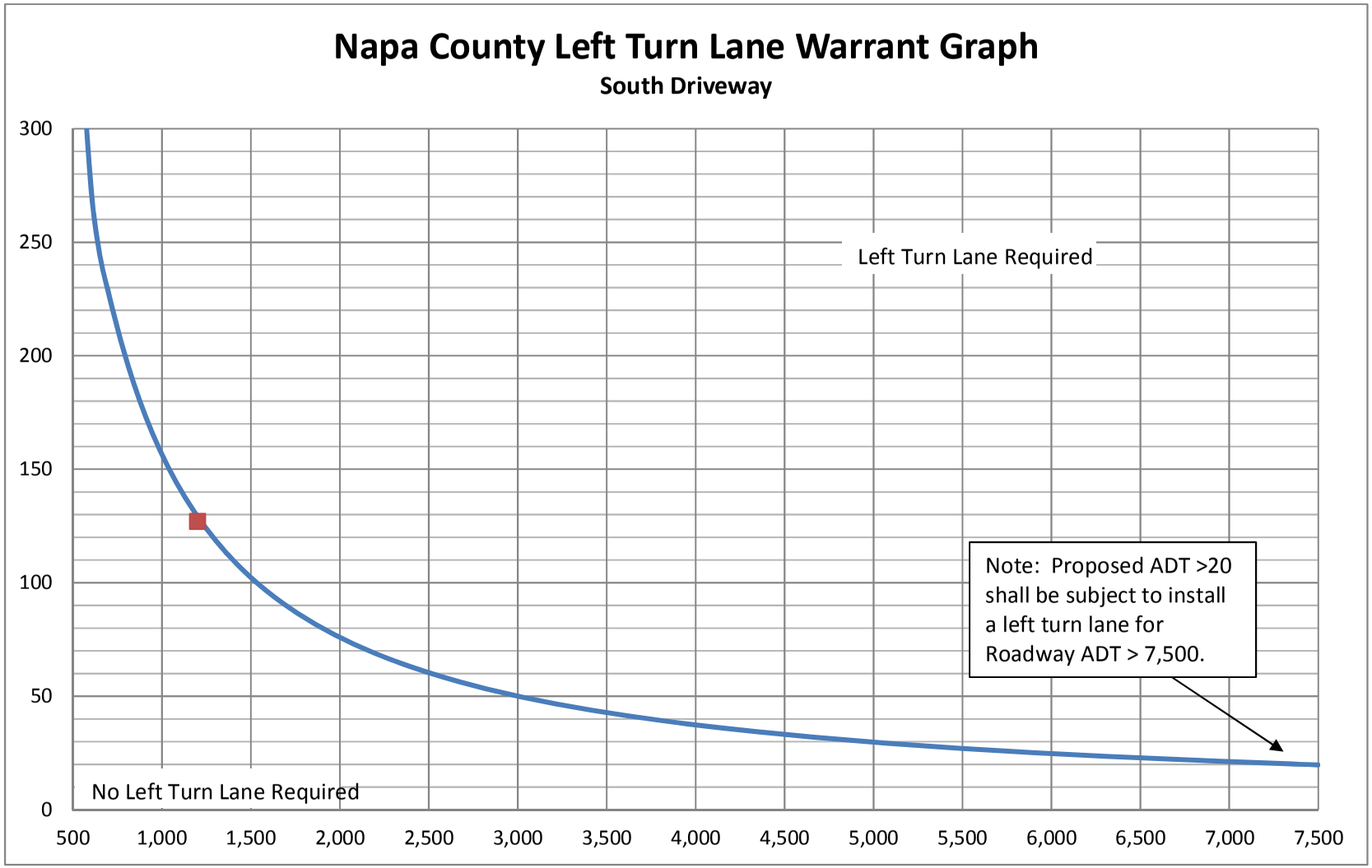
Number of event staff (largest event):	20	x 2 one-way trips per staff person	=	40 trips.
Number of visitors (largest event):	250	/ 2.8 visitors per vehicle x 2 one-way trips	=	179 trips.
Number of special event truck trips (largest event):	4	x 2 one-way trips	=	8 trips.

[3] Assumes 1.47 materials & supplies trips + 0.8 case goods trips per 1,000 gallons of production / 250 days per year (see *Traffic Information Sheet Addendum* for reference).
[4] Assumes 4 tons per trip / 36 crush days per year (see *Traffic Information Sheet Addendum* for reference).

Appendix D

Proportional Share Calculations and Left-Turn Warrant Spreadsheets

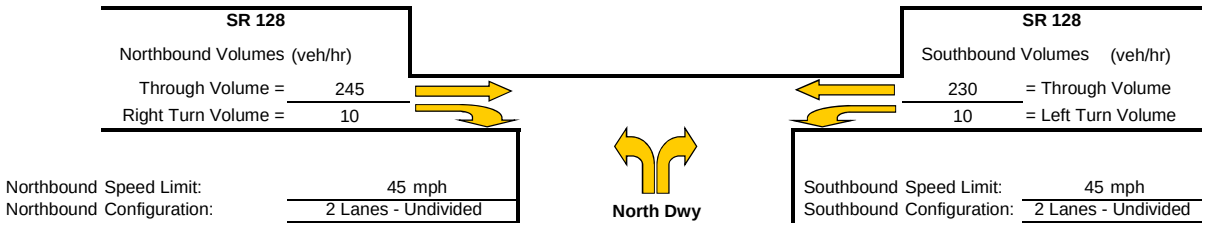

Napa County Left Turn Lane Warrant Graph
North Driveway
400
350
300
250
200
150
100
50
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
Left Turn Lane Required
Note: Proposed ADT >20 shall be subject to install a left turn lane for Roadway ADT > 7,500.
No Left Turn Lane Required


Napa County Left Turn Lane Warrant Graph
South Driveway
300
250
200
150
100
50
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
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.

Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: SR 128/North Driveway
Study Scenario: PM Future plus Project

Direction of Analysis Street: North/South
Cross Street Intersects: From the East



Northbound Speed Limit: 45 mph
Northbound Configuration: 2 Lanes - Undivided

Southbound Speed Limit: 45 mph
Southbound Configuration: 2 Lanes - Undivided

Northbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	255
If AV<Va then warrant is met		-

Right Turn Lane Warranted: **NO**

Northbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

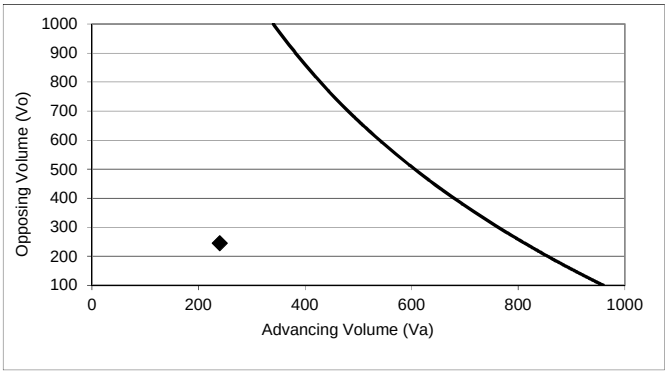
Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	255
If AV<Va then warrant is met		-

Right Turn Taper Warranted: **NO**

Southbound Left Turn Lane Warrants

Percentage Left Turns	%lt	4.2 %
Advancing Volume Threshold	AV	812 veh/hr

If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 45 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements* , January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.