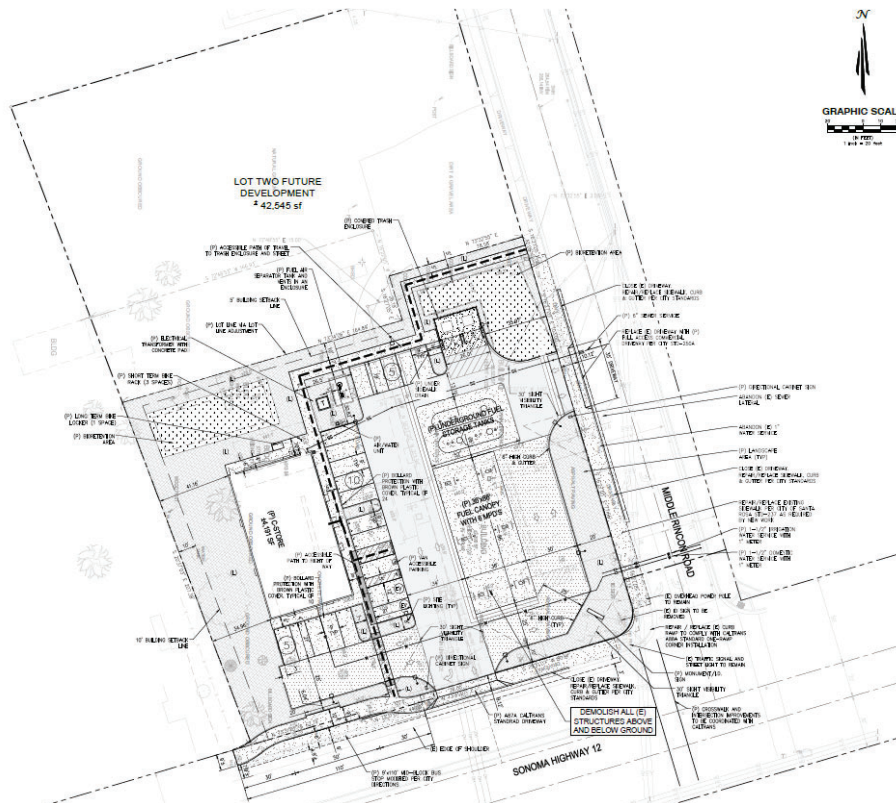




# Final Traffic Impact Study for the 7-Eleven at 43 Middle Rincon Road



Prepared for the City of Santa Rosa

Submitted by  
**W-Trans**

April 6, 2021



**TRAFFIC ENGINEERING  
TRANSPORTATION PLANNING**  
*Balancing Functionality and Livability since 1995*  
w-trans.com



**This page intentionally left blank**

# Table of Contents

---

|                                        |    |
|----------------------------------------|----|
| Executive Summary .....                | 1  |
| Introduction.....                      | 2  |
| Transportation Setting.....            | 4  |
| Capacity Analysis .....                | 7  |
| Alternative Modes .....                | 20 |
| Access and Circulation .....           | 21 |
| Parking.....                           | 22 |
| Conclusions and Recommendations.....   | 23 |
| Study Participants and References..... | 24 |

## Figures

|                                                      |    |
|------------------------------------------------------|----|
| 1. Study Area and Existing Lane Configurations ..... | 3  |
| 2. Existing Traffic Volumes .....                    | 10 |
| 3. Baseline Traffic Volumes .....                    | 12 |
| 4. Site Plan .....                                   | 13 |
| 5. Project Traffic Volumes.....                      | 15 |
| 6. Existing Plus Project Traffic Volumes.....        | 17 |
| 7. Baseline Plus Project Traffic Volumes .....       | 19 |

## Tables

|                                                                                      |    |
|--------------------------------------------------------------------------------------|----|
| 1. Collision Rates for the Study Intersections .....                                 | 5  |
| 2. Bicycle Facility Summary .....                                                    | 6  |
| 3. Signalized Intersection Level of Service Criteria .....                           | 7  |
| 4. Existing Peak Hour Intersection Levels of Service .....                           | 9  |
| 5. Baseline Peak Hour Intersection Levels of Service .....                           | 11 |
| 6. Trip Generation Summary .....                                                     | 14 |
| 7. Existing and Existing plus Project Peak Hour Intersection Levels of Service ..... | 16 |
| 8. Baseline and Baseline plus Project Peak Hour Intersection Levels of Service.....  | 18 |
| 9. Parking Analysis Summary .....                                                    | 22 |

## Appendices

- A. Collision Rate Calculations
- B. Intersection Level of Service Calculations
- C. VMT Screen Map





**This page intentionally left blank**

# Executive Summary

---

The project as proposed would result in the demolition of an existing convenience market and construction of a 4,191 square foot convenience market with 12 fueling positions. The site would be accessible via two existing driveways, one off Middle Rincon Road with full ingress and egress, and the other off Highway 12 with access limited to right turns in/out only. Additionally, the proposed project includes the relocation of a SCT bus stop to increase transit accessibility and efficiency along Highway 12 within the vicinity of the project site.

Under Existing and Existing plus Approved Projects conditions, both study intersections operate or are expected to operate at an acceptable Level of Service (LOS) of D or better during both the a.m. and p.m. peak hours.

The project is expected to generate an average of 749 new daily trips, including 60 a.m. peak hour trips and 41 p.m. peak hour trips. Deductions were taken to account for trips generated by the existing convenience market and expected pass-by trips. After adding trips from the proposed project to Existing and Existing plus Projects volumes, the study intersections are anticipated to continue operating at the same Levels of Service of LOS D or better.

The project is expected to have a less-than-significant impact on VMT as it is considered local-serving retail.

Sight distances along Highway 12 and Middle Rincon Road are adequate from each driveway.

To improve pedestrian facilities and connectivity to transit, a crosswalk should be installed at the west leg of the intersection of Highway 12/Middle Rincon Road, and the sidewalk gap on the south side of Highway 12 west of the intersection should be closed.

The proposed project would provide 20 on-site parking spaces, which is one more than required under the City of Santa Rosa City Code.

# Introduction

---

This report presents an analysis of the potential traffic impacts that would be associated with development of a proposed 7-Eleven at 43 Middle Rincon Road in the City of Santa Rosa. The traffic study was completed in accordance with the criteria established by the City of Santa Rosa and is consistent with standard traffic engineering techniques.

## Prelude

The purpose of a traffic impact study is to provide City staff and policy makers with data they can use to make an informed decision regarding the potential traffic impacts and adverse effects of a proposed project, and any associated improvements that would be required to mitigate these impacts to a level of insignificance as defined by the City's General Plan or other policies and address adverse effects. Vehicular traffic is 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 if the new traffic would be expected to have an adverse effect on operation of critical intersections or roadway segments. Impacts relative to access for pedestrians, bicyclists, and to transit are also addressed.

## Project Profile

The proposed project includes demolition of an existing convenience market and construction of a 4,191 square foot convenience market with 12 fueling positions. The site would be accessible via two existing driveways, one off Middle Rincon Road with full ingress and egress and the other off Highway 12 with access limited to right turns in/out only. The project site is located at 43 Middle Rincon Road, as shown in Figure 1.



Traffic Impact Study for the 7-Eleven at 43 Middle Rincon Road  
**Figure 1 – Study Area and Existing Lane Configurations**

# Transportation Setting

---

## Operational Analysis

### Study Area and Periods

It is noted that the project driveways were not considered as study intersections. The *California Vehicle Code* defines an intersection as “the area embraced within the prolongation of the lateral curb lines, or, if none, then the lateral boundary lines of the roadways, of two highways which join one another at approximately right angles or the area within which vehicles traveling upon different highways joining at any other angle may come in conflict.” This definition specifies that intersections are created where two “highways,” or public streets, intersect. As driveways are not public streets, where they connect with a public road is not an intersection, so it would be unreasonable to evaluate it as such. The driveway connection should, however, be evaluated for operational issues such as adequacy of sight distance, need for turn lanes, and delay may be relevant in some cases, though it would not be associated with a Level of Service.

Operating conditions during the a.m. and p.m. peak periods were evaluated to capture the highest potential impacts for the proposed project as well as the highest volumes on the local transportation network. The morning peak hour occurs between 7:00 a.m. and 9:00 a.m. and reflects conditions during the home to work or school commute, while the p.m. peak hour occurs between 4:00 p.m. and 6:00 p.m. and typically reflects the highest level of congestion during the homeward bound commute.

### Study Intersections

**Highway 12 (Sonoma Highway)/Middle Rincon Road** is a signalized tee intersection including a driveway located at the south leg. Protected left-turn phasing is present on Sonoma Highway. Marked crosswalks are provided on the north and east legs.

**Highway 12 (Sonoma Highway)/Calistoga Road** is a signalized, four-legged intersection, with protected left-turn phasing on Sonoma Highway and split phasing on Calistoga Road. The southbound approach includes a right-turn overlap phase. Marked crosswalks are provided on the north, south, and east legs.

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

## Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available is September 1, 2014 through August 31, 2019.

As presented in Table 1, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2016 Collision Data on California State Highways*, California Department of Transportation (Caltrans). For the five-year period reviewed, collision rates for the two study intersections were below the statewide average. The collision rate calculations are provided in Appendix A.



**Table 1 – Collision Rates for the Study Intersections**

| <b>Study Intersection</b>  | <b>Number of Collisions (2014-2019)</b> | <b>Calculated Collision Rate (c/mve)</b> | <b>Statewide Average Collision Rate (c/mve)</b> |
|----------------------------|-----------------------------------------|------------------------------------------|-------------------------------------------------|
| 1. Hwy 12/Middle Rincon Rd | 20                                      | 0.34                                     | 0.43                                            |
| 2. Hwy 12/Calistoga Rd     | 16                                      | 0.27                                     | 0.43                                            |

Note: c/mve = collisions per million vehicles entering

## Alternative Modes

### Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site; however, sidewalk gaps and barriers can be found along both Highway 12 and Middle Rincon Road connecting to the project site. Existing gaps and obstacles along the connecting roadways impact convenient and continuous access for pedestrians and present safety concerns in those locations where appropriate pedestrian infrastructure would address potential conflict points.

### Bicycle Facilities

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

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

In the project area, Class II bike lanes exist on Calistoga Road between Badger Road and Highway 12. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project study area. Table 2 summarizes the existing and planned bicycle facilities in the project vicinity. According to the *City of Santa Rosa Bicycle and Pedestrian Master Plan Update 2018*, bicycle lanes are proposed along Highway 12 between Farmers Lane and Los Alamos Road. Bicycle lanes are also planned along Middle Rincon Road between Montecito Boulevard and Highway 12.

**Table 2 – Bicycle Facility Summary**

| <b>Status Facility</b> | <b>Class</b> | <b>Length (miles)</b> | <b>Begin Point</b> | <b>End Point</b> |
|------------------------|--------------|-----------------------|--------------------|------------------|
| <b>Existing</b>        |              |                       |                    |                  |
| Calistoga Rd           | II           | 1.38                  | Badger Rd          | Hwy 12           |
| <b>Planned</b>         |              |                       |                    |                  |
| Hwy 12                 | II           | 0.94                  | Farmers Ln         | Los Alamos Rd    |
| Middle Rincon Rd       | II           | 1.00                  | Montecito Blvd     | Hwy 12           |

Source: *City of Santa Rosa Bicycle and Pedestrian Master Plan Update 2018*, City of Santa Rosa, 2018

## Transit Facilities

Both Sonoma County Transit and Santa Rosa CityBus have routes that stop on Highway 12 within one-quarter mile walking distance from the project site.

Sonoma County Transit (SCT) provides regional bus service throughout Sonoma County and within the City of Santa Rosa. SCT Route 30 provides fixed service between the Kaiser Hospital on Bicentennial Avenue and the Sonoma Plaza, with stops along Highway 12 and at the Santa Rosa Transit Mall. Weekday service operates Monday through Friday with approximately one- to two-hour headways between 5:50 a.m. and 9:25 p.m. Weekend service operates Saturday and Sunday with approximately three-hour headways between 7:25 a.m. and 8:12 p.m.

Route 34 provides commute service between the Santa Rosa Transit Mall and the Sonoma Plaza, with stops along Highway 12. Route 34 operates Monday through Friday between 6:45 a.m. and 7:53 a.m. during the morning, and then between 3:50 p.m. and 5:00 p.m. during the evening peak hour.

Santa Rosa CityBus provides fixed route bus service within the City of Santa Rosa. Route 4/4B provides loop bus service between the Santa Rosa Transit Mall and the St. Francis Shops on Highway 12. Weekday service operates with 30-minute headways between 6:00 a.m. and 8:20 p.m. Weekend service operates with one-hour headways, between 6:00 a.m. and 7:50 p.m. on Saturdays and 10:00 a.m. and 4:50 p.m. on Sundays.

Two bicycles can be carried on most SCT and CityBus buses. Bike rack space is a first come first served basis. Additional bicycles are allowed on SCT buses at the discretion of the driver.

Dial-a-ride, also known as paratransit, or door-to-door service, is available for those who are unable to independently use the transit system due to a physical or mental disability. SCT is designed to serve the needs of individuals with disabilities within the Santa Rosa area and the surrounding areas within the County of Sonoma and includes areas within three-quarters of a mile from an active SCT fixed-route service. CityBus serves areas within a three-quarters of a mile from an active CityBus route.

# 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 the signalized methodology published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2000 and 2010. 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 signalized methodology is based on factors including traffic volumes, green time for each movement, phasing, whether the signals are coordinated or not, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. For purposes of this study, delays were calculated using signal timing obtained from Caltrans and the City of Santa Rosa.

The ranges of delay associated with the various levels of service are indicated in Table 3.

**Table 3 – Signalized Intersection Level of Service Criteria**

|       |                                                                                                                               |
|-------|-------------------------------------------------------------------------------------------------------------------------------|
| LOS A | Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.                                 |
| LOS B | Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.                    |
| LOS C | Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping. |
| LOS D | Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.                         |
| LOS E | Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.                     |
| LOS F | Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.                       |

Reference: *Highway Capacity Manual*, Transportation Research Board, 2000 and 2010

## Traffic Operation Standards

### City of Santa Rosa

Section 5.8 Transportation Goals & Policy of the City of Santa Rosa General Plan states:

*T-D-1 Maintain a Level of Service (LOS) D or better along all major corridors. Exceptions to meeting the standard include:*

- *Within downtown;*
- *Where attainment would result in significant degradation;*
- *Where topography or impacts makes the improvement impossible; or*
- *Where attainment would ensure loss of an area's unique character.*

*The LOS is to be calculated using the average traffic demand over the highest 60-minute period.*

*Traffic Engineering Division will require a level of service evaluation of arterial and collector corridors if deemed necessary.*

*T-D-2 Monitor level of service at intersections to assure that improvements or alterations to improve corridor level of service do not cause severe impacts at any single intersection.*

General interpretation of Policy T-D-2. The impact to an intersection is considered adverse if the project related and/or future trips result in:

1. The level of service (LOS) at an intersection degrading from LOS D or better to LOS E or F, OR
2. An increase in average vehicle delay of greater than 5 seconds at a signalized intersection where the current LOS is either LOS E or F.
3. Queuing impacts based on a comparative analysis between the design queue length and the available queue storage capacity. Impacts include, but are not limited to, spillback queue at project access locations (both ingress and egress), turn lanes at intersections, lane drops, spill back that impacts upstream intersections or interchange ramps.
4. Exceptions may be granted under the following conditions:
  - a. Within downtown,
  - b. Where attainment would result in significant degradation,
  - c. Where topography or impacts makes the improvement impossible; or
  - d. Where attainment would ensure loss of an area's unique character.

*T-C-3 Implement traffic calming techniques on streets subject to high speed and/or cut-through traffic, in order to improve neighborhood livability, Techniques Include:*

- *Narrow Streets*
- *On-street parking*
- *Choker or diverters*
- *Decorative crosswalks*
- *Planted islands*

General interpretation of Policy T-C-3. An impact is considered adverse if the project has the potential to alter community character by significantly increasing cut-through traffic, unexpected vehicle maneuvers or commercial vehicle trips in a residential area.

*T-H-3 Require new development to provide transit improvements, where a rough proportionality to demand from the project is established. Transit improvements may include:*

- *Direct and paved pedestrian access to transit stops*
- *Bus turnouts and shelters*
- *Lane width to accommodate buses.*

General interpretation of Policy T-H-3. An impact is considered adverse if the project has the potential to disrupt existing transit operations or establishes transit facilities and equipment such that it creates a sight distance deficiency or vehicle conflict point.

*T-J Provide attractive and safe streets for pedestrian and bicyclists.*

General interpretation of Policy T-J. An impact is considered adverse if the project generates 20 pedestrians in any single hour at an unsignalized intersection, mid-block crossing or where no crossing has been established.

An impact is further considered significant if the project interrupts existing or proposed pedestrian, bicycle and transit facilities, path or travel, direct access resulting in excessive rerouting or creates a vehicle conflict condition which affects the safety of other roadway users.

## Caltrans

Caltrans does not have a standard of significance relative to operation as this is no longer a CEQA issue. As indicated in the *Vehicle Miles Traveled-Focused Transportation Impact Study Guide*, May 20, 2020, the Department is transitioning away from requesting LOS or other vehicle operations analyses of land use projects and will instead focus on Vehicle Miles Traveled (VMT).

## Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. It should be noted that traffic counts collected September 22, 2020 were factored to reflect traffic conditions without the presence of the 2020 Coronavirus Pandemic. Volume data was collected when local schools were in session, but it is noted that the majority of students were participating in socially distanced learning environments and were not attending classes on local campuses.

## Intersection Levels of Service

Under existing conditions, both study intersections are operating acceptably. A summary of the intersection Level of Service calculations is contained in Table 4, and copies of the Level of Service calculations are provided in Appendix B. The existing traffic volumes are shown in Figure 2.

**Table 4 – Existing Peak Hour Intersection Levels of Service**

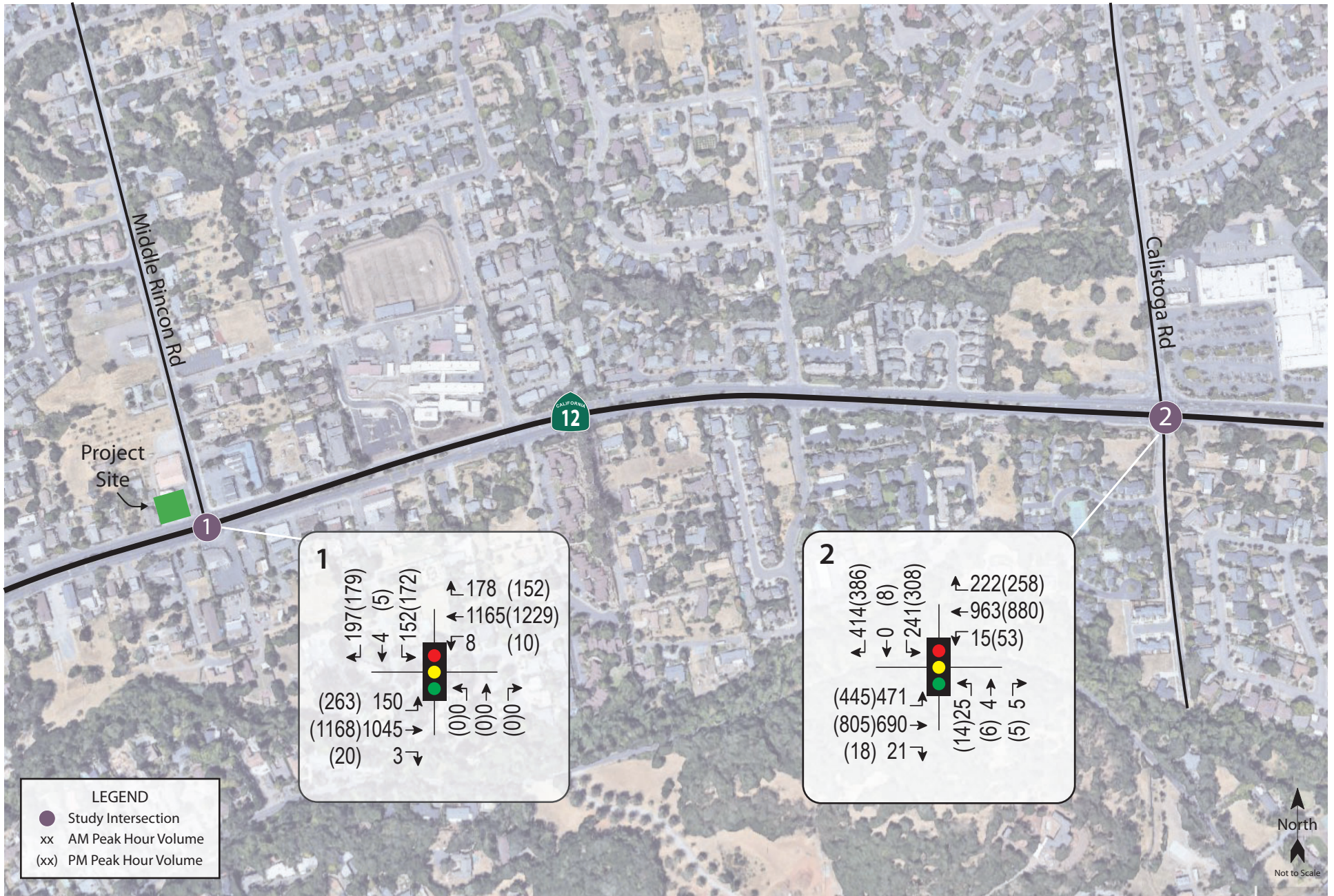
| Study Intersection         | AM Peak |     | PM Peak |     |
|----------------------------|---------|-----|---------|-----|
|                            | Delay   | LOS | Delay   | LOS |
| 1. Hwy 12/Middle Rincon Rd | 19.0    | B   | 23.9    | C   |
| 2. Hwy 12/Calistoga Rd     | 34.3    | C   | 38.8    | D   |

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

## Baseline Conditions

Baseline (Existing plus Approved or Pending) operating conditions were determined with traffic from approved and pending projects in and near the study area added to the Existing volumes. As directed by staff, the following projects contained in the Citywide Summary of Pending Development Report were included for Baseline Conditions. The same trip generation and trip distribution assumptions used in the traffic studies for the projects were used in this analysis. Standard rates as published in *Trip Generation Manual*, 10<sup>th</sup> Edition, 2017, were applied in all traffic studies.

**Elnoka Continuing Care Retirement Community** is a Continuing Care Retirement Community (CCRC) project that includes 74 detached cottages, 528 apartment units, a 62-unit assisted living facility, and 12 onsite multifamily affordable housing units for identified as employee housings. The project would also provide onsite amenities for the exclusive use of residents including dining rooms, a café, salon, banking services, business center, fitness center, swimming pool, sports courts, and walking paths. The project site is located on Sonoma Highway immediately northwest of the existing Oakmont retirement community.



Traffic Impact Study for the 7-Eleven at 43 Middle Rincon Road  
**Figure 2 – Existing Traffic Volumes**

**Middle Rincon Subdivision** is an approved subdivision to be located at 117 Middle Rincon Road. The proposed project includes the construction of six single family residential units.

**Recess Self-Storage Mixed-Use Development** includes the construction of a 2.68-acre parcel to include two multi-family housing structures and a 124,000-square foot, four-story self-storage facility to be located at 4224 Sonoma Highway.

**MidPen Housing Development Project** would result in construction of 99 multi-family units and would provide 128 vehicle parking spaces. The site consists of a vacant parcel, which previously contained the Prickett’s Nursery Center.

**Storage Pro II Project** would result in the construction of a mixed development consisting of 30 apartments and approximately 149,000 square feet of mini-storage space at 4322-4374 Sonoma Highway. The apartments will be comprised of 12 one-bedroom, 12 two-bedroom, and six three-bedroom units.

**Starbucks** would occupy 2,200 square feet of the existing 3,759 square foot building and convert the use to a coffee shop 4620 Highway 12. The existing drive-through service window for the bank would be converted to a drive-through window for Starbucks.

Upon adding trips from the approved and pending projects to Existing volumes, the study intersections are expected to operate acceptably. Operating conditions are summarized in Table 5 and Baseline volumes are shown in Figure 3.

| <b>Table 5 – Baseline Peak Hour Intersection Levels of Service</b> |                |            |                |            |
|--------------------------------------------------------------------|----------------|------------|----------------|------------|
| <b>Study Intersection</b>                                          | <b>AM Peak</b> |            | <b>PM Peak</b> |            |
|                                                                    | <b>Delay</b>   | <b>LOS</b> | <b>Delay</b>   | <b>LOS</b> |
| 1. Hwy 12/Middle Rincon Rd                                         | 19.1           | B          | 24.7           | C          |
| 2. Hwy 12/Calistoga Rd                                             | 36.8           | D          | 46.8           | D          |

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

## Project Description

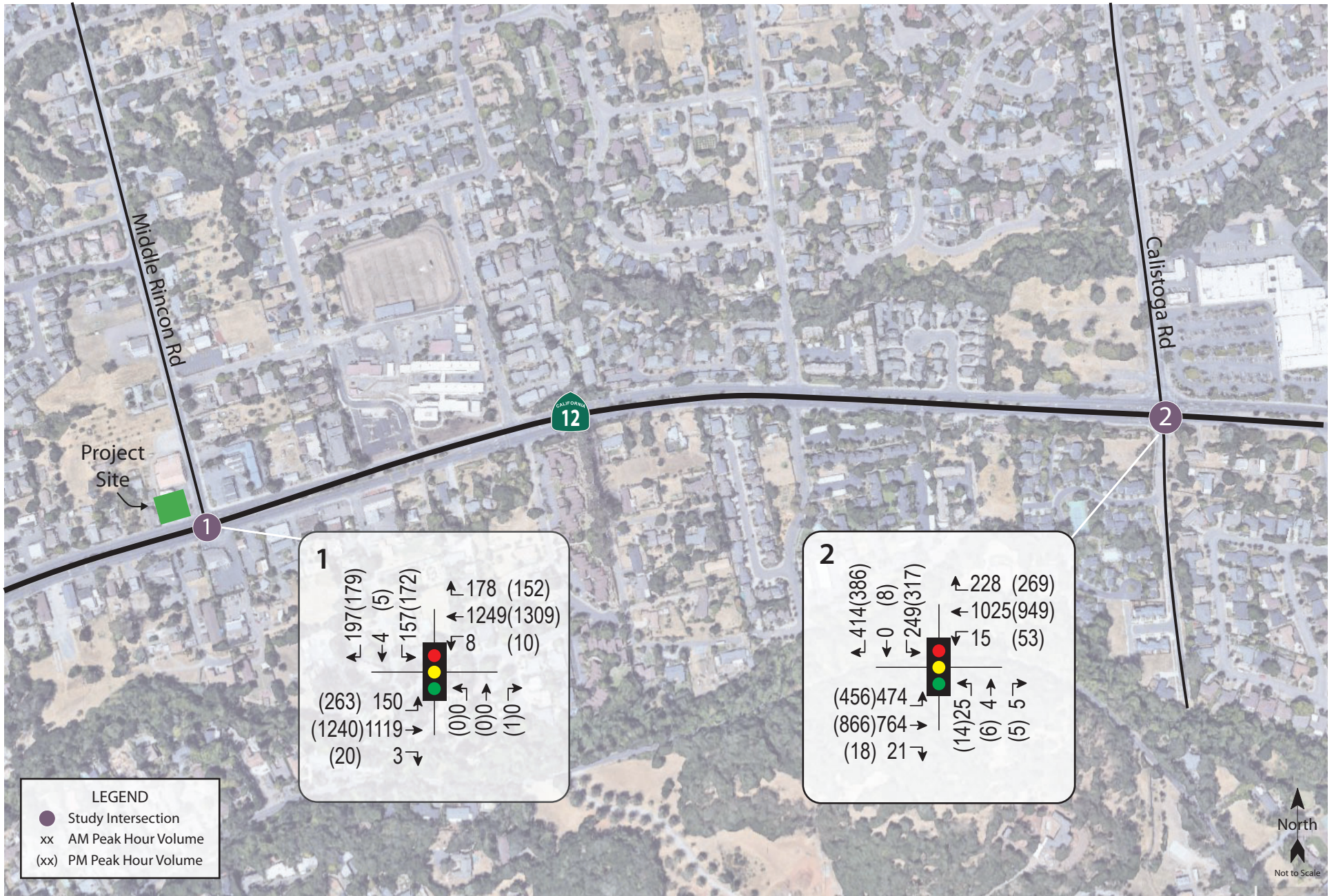
The proposed project includes demolition of an existing convenience market (approximately 2,400 square feet in size) and construction of a 4,191 square foot convenience market with 6 pumps with two fueling positions each. The site would be accessible via two existing driveways, one off Middle Rincon Road with full ingress and egress, and the other off Highway 12 with access limited to right turns in/out only. The proposed project site plan is shown in Figure 4.

## Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 10<sup>th</sup> Edition, 2017 for “Super Convenience Market/Gas Station” (ITE LU 960). Because the site is currently occupied by a 7-Eleven convenience market without fuel pumps, the trip generation of the existing market was considered. “Convenience Market” rates (ITE LU 851) were applied to the existing 7-Eleven.

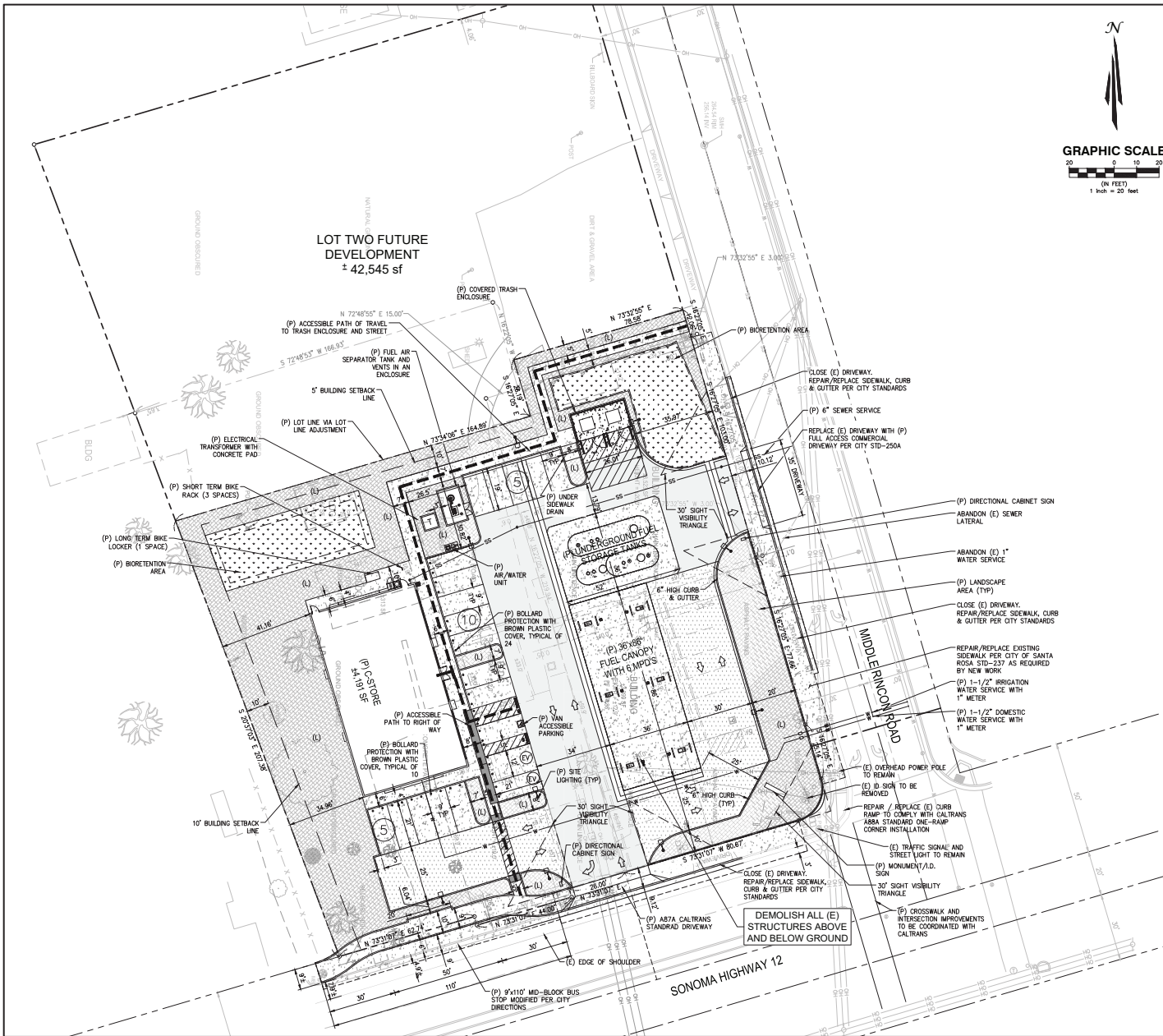
## Pass-by Trips

Some portion of traffic associated with gas stations is drawn from existing traffic on nearby streets. These vehicle trips are not considered “new,” but are instead comprised of drivers who are already driving on the adjacent street



Traffic Impact Study for the 7-Eleven at 43 Middle Rincon Road  
**Figure 3 – Baseline Traffic Volumes**





### VICINITY MAP

| Rev. # | Date | Description |
|--------|------|-------------|
|        |      |             |
|        |      |             |
|        |      |             |
|        |      |             |

### PROJECT DATA

|                              |                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROJECT INFORMATION:         | TAIT & ASSOCIATES, INC.<br>ATTN: KIM BARNETT<br>1130 TRADE CENTER DRIVE<br>RANCHO CORDOVA, CA 95742<br>TEL: (916) 869-1822<br>kbarrett@taic.com                                                                                                                                                                                                                                    |
| OWNER:                       | 7-ELEVEN, INC.<br>P.O. BOX 711<br>DALLAS, TX 75221-0711                                                                                                                                                                                                                                                                                                                            |
| ASSESSOR'S PARCEL NUMBER(S): | 182-540-024 & 025                                                                                                                                                                                                                                                                                                                                                                  |
| ADDRESS:                     | 7-ELEVEN<br>43 MIDDLE RINCON ROAD<br>SANTA ROSA, CA 95405                                                                                                                                                                                                                                                                                                                          |
| PROJECT DESCRIPTION:         | NEW CONSTRUCTION - GROUND UP 7-11 CONVENIENCE STORE, FUEL STATION                                                                                                                                                                                                                                                                                                                  |
| CONSTRUCTION TYPE:           | NORTH: R-1-E SINGLE FAMILY RESIDENTIAL<br>SOUTH: C2 COMMERCIAL GENERAL<br>EAST: C2 COMMERCIAL GENERAL<br>WEST: R-1-E SINGLE FAMILY RESIDENTIAL                                                                                                                                                                                                                                     |
| EXISTING ZONING:             | C2 COMMERCIAL GENERAL & R-1-E SINGLE FAMILY RESIDENTIAL                                                                                                                                                                                                                                                                                                                            |
| EXISTING LAND USE:           | RETAIL AND BUSINESS SERVICES                                                                                                                                                                                                                                                                                                                                                       |
| PROPOSED ZONING:             | C2 COMMERCIAL GENERAL & R-1-E SINGLE FAMILY RESIDENTIAL                                                                                                                                                                                                                                                                                                                            |
| PROPOSED LAND USE:           | FUEL STATION, CONVENIENCE STORE                                                                                                                                                                                                                                                                                                                                                    |
| BUILDING INFORMATION:        | EXISTING SITE AREA: 182-540-024: 440,500 S.F. (10.03 ACRES)<br>182-540-025: 255,300 S.F. (5.82 ACRES)<br>PROPOSED SITE AREA: 450,940 S.F. (10.27 ACRES)<br>PROPOSED BUILDING AREA: 4,191 S.F. (C-STORE)<br>PROPOSED BUILDING COVERAGE: 38.2%<br>PROPOSED PAVED AREA: 428,700 S.F. (9.80 AC)<br>PROPOSED LANDSCAPE AREA: 114,283 S.F. (2.62 AC)<br>BUILDING HEIGHT: 55 FEET MAXIMUM |
| REQUIRED BUILDING SETBACKS:  | FRONT: 0 FEET<br>REAR: 10 FEET ADJACENT TO RESIDENTIAL<br>SIDE (STREET): 0 FEET<br>SIDE (INTERIOR): 5 FEET ADJACENT TO RESIDENTIAL                                                                                                                                                                                                                                                 |
| PARKING REQUIRED:            | 19 STALLS (1 STALL PER 250 S.F. OF FLOOR AREA) = 17 + 2 FOR EMPLOYEES (1 EA)<br>BIKECYCLE: 1 LONGTERM, 3 SHORT TERM                                                                                                                                                                                                                                                                |
| PARKING PROVIDED:            | 20 STALLS: 1 BIKECYCLE, 1 LONGTERM, 3 SHORT TERM                                                                                                                                                                                                                                                                                                                                   |
| ACCESSIBLE PARKING REQUIRED: | 1 STALL                                                                                                                                                                                                                                                                                                                                                                            |
| ACCESSIBLE PARKING PROVIDED: | 1 STALL                                                                                                                                                                                                                                                                                                                                                                            |
| UTILITY INFORMATION:         | ELECTRICAL: PG&E<br>GAS: PG&E<br>WATER: CITY OF SANTA ROSA<br>STORM SEWER: CITY OF SANTA ROSA<br>SEWER: CITY OF SANTA ROSA                                                                                                                                                                                                                                                         |

### LEGEND

- FOUND MONUMENT WELL
- (E) GUY WIRE
- (E) POWER POLE
- (E) TRAFFIC SIGNAL WITH STREET LIGHT
- (E) YARD LIGHT
- PROPERTY LINES
- - - ACCESSIBLE PATH OF TRAVEL
- SAWCUT LINE
- ▨ CONCRETE PAVING
- ▤ BIORETENTION AREA
- ▩ LANDSCAPE AREA
- ▧ ASPHALT PAVING

|                                                                                                                                                                                                                                                                                                            |                  |              |                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------|----------------|
| SCALE: 1"=20'-0"                                                                                                                                                                                                                                                                                           | DATE: 09/22/2020 | DRAWN BY: SG | CHECKED BY: JR |
| <p>THESE CHANGES AND REVISIONS ARE THE PROPERTY OF TAIT &amp; ASSOCIATES, INC. AND SHALL BE KEPT IN THE PROJECT FILE. NO PART OF THIS DOCUMENT IS TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, WITHOUT THE WRITTEN PERMISSION OF TAIT &amp; ASSOCIATES, INC.</p> |                  |              |                |

PROJECT: 7-ELEVEN #14141  
SHEET: C1

Source: TAIT & ASSOCIATES 2/21

Traffic Impact Study for the 7-Eleven at 43 Middle Rincon Road  
Figure 4 – Site Plan

system and choose to make an interim stop and are referred to as “pass-by.” For the proposed project, pass-by trips would in essence be “captured” from traffic on Highway 12 and Middle Rincon Road.

The percentage of these pass-by trips was developed based on information provided in the *Trip Generation Manual*. This reference includes pass-by data collected at numerous locations for many land uses, such as the convenience market and convenience market with a gas station uses applied in this traffic analysis. It is noted that pass-by rates for the proposed project were based on the land use “Gas/Service Station with Convenience Market” (ITE LU 945) since it is a similar land use and there were not specific pass-by rates for ITE Land Use 960. Rates for both the a.m. and p.m. peak periods are available for a convenience market with a gas station, but there is only a p.m. peak hour rate for a convenience market. Looking at the surveyed data used to develop the ITE trip generation for a convenience market, since the trip generation rate for the a.m. peak hour is higher than the p.m. peak rate by 6.7 percent on average, the p.m. peak hour pass-by rate of 51 percent was multiplied by 1.067 and the resulting 54 percent rate was assumed for the a.m. peak hour. These rates were applied as a deduction to the overall trips generated by the project.

## Total Project Trip Generation

The expected trip generation potential for the proposed project is indicated in Table 6, with deductions taken for trips made to and from the existing convenience market at the site, which will be replaced by the project, as well as for pass-by trips. The proposed project is expected to generate an average of 3,510 trips per day at the driveways, including 348 trips during the a.m. peak hour and 290 during the p.m. peak hour. After deductions for pass-by trips and the prior use are taken into account, the project would be expected to generate 749 more primary trips on a daily basis than the existing market, including 60 more trips during the morning peak hour and 41 more trips in the evening peak hour. Project traffic volumes are shown in Figure 5.

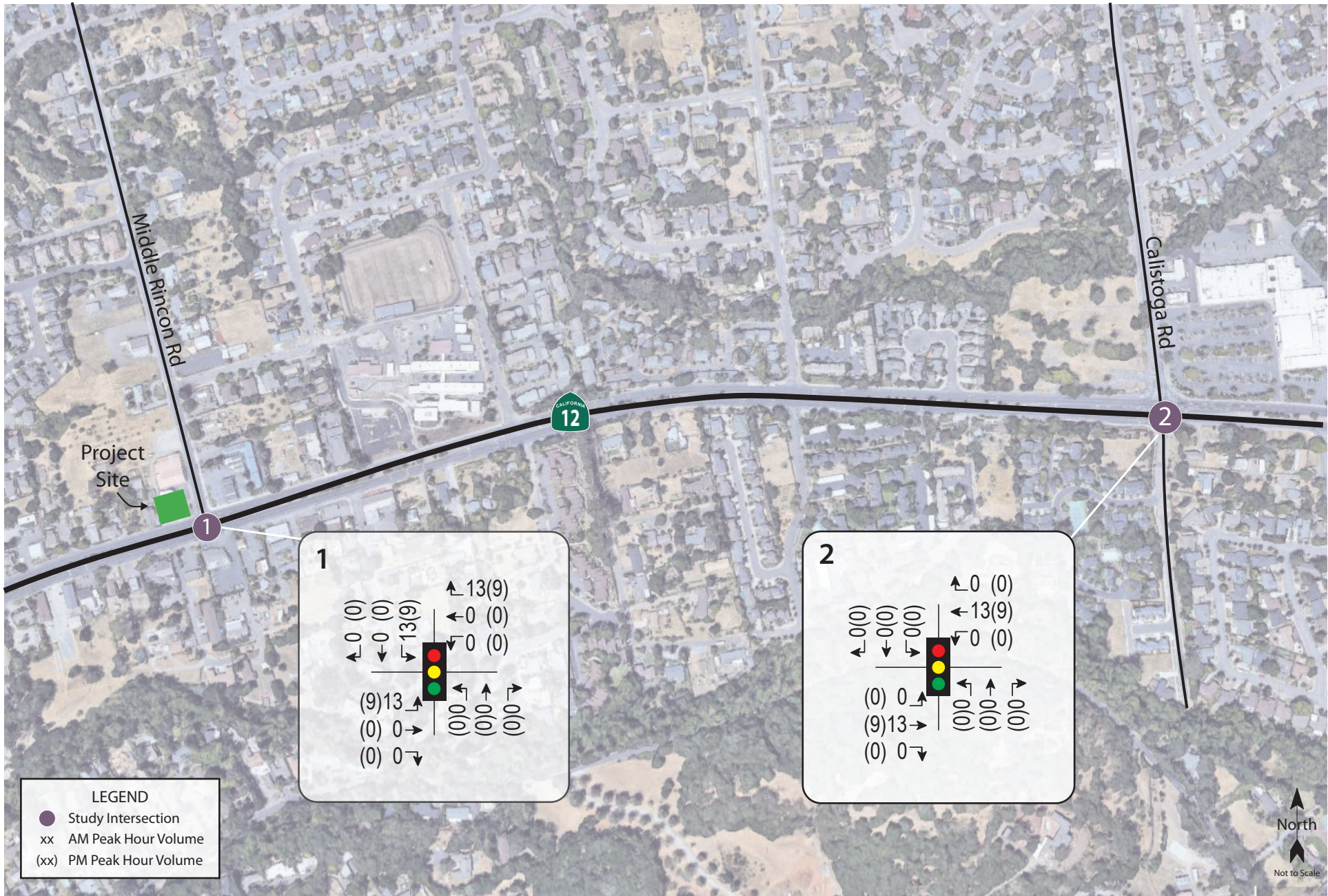
**Table 6 – Trip Generation Summary**

| Land Use                             | Units    | Daily  |               | AM Peak Hour |            |            |            | PM Peak Hour |            |            |            |
|--------------------------------------|----------|--------|---------------|--------------|------------|------------|------------|--------------|------------|------------|------------|
|                                      |          | Rate   | Trips         | Rate         | Trips      | In         | Out        | Rate         | Trips      | In         | Out        |
| <b>Existing</b>                      |          |        |               |              |            |            |            |              |            |            |            |
| Convenience Market                   | -2.4 ksf | 762.28 | 1,829         | 62.54        | 150        | 75         | 75         | 49.11        | 118        | 60         | 58         |
| Pass-by                              |          | -45%   | -823          | -54%         | -81        | -40        | -41        | -51%         | -60        | -31        | -29        |
| <i>Existing Sub-Total</i>            |          |        | <i>-1,006</i> |              | <i>-69</i> | <i>-35</i> | <i>-34</i> |              | <i>-58</i> | <i>-29</i> | <i>-29</i> |
| <b>Proposed</b>                      |          |        |               |              |            |            |            |              |            |            |            |
| Super Convenience Market/Gas Station | 4.2 ksf  | 837.58 | 3,510         | 83.14        | 348        | 174        | 174        | 69.28        | 290        | 145        | 145        |
| Pass-by Reduction                    |          | -50%   | -1,755        | -63%         | -219       | -109       | -110       | -66%         | -191       | -96        | -95        |
| <i>Proposed Sub-Total</i>            |          |        | <i>1,755</i>  |              | <i>129</i> | <i>65</i>  | <i>64</i>  |              | <i>99</i>  | <i>49</i>  | <i>50</i>  |
| <b>Net New Total</b>                 |          |        | <b>749</b>    |              | <b>60</b>  | <b>30</b>  | <b>30</b>  |              | <b>41</b>  | <b>20</b>  | <b>21</b>  |

Note: ksf = 1,000 square feet

## Vehicle Miles Traveled

Senate Bill (SB) 743 established a change in the metric to be applied to determining traffic impacts associated with development projects. Rather than the delay-based criteria associated with a Level of Service analysis, the change in Vehicle Miles Traveled (VMT) as a result of a project is now the basis for determining California Environmental Quality Act (CEQA) impacts with respect to transportation and traffic. The City of Santa Rosa has



Traffic Impact Study for the 7-Eleven at 43 Middle Rincon Road  
**Figure 5 – Project Traffic Volumes**

established parameters for VMT analyses in the *Vehicles Miles Traveled Guidelines Final Draft*, June 2020. The City's parameters are generally consistent with guidance provided in the publication *Transportation Impacts (SB 743) CEQA Guidelines Update and Technical Advisory*, California Governor's Office of Planning and Research (OPR), 2018.

Both the City and OPR Technical Advisory guidelines indicate that retail development should be assessed using a "total VMT" metric, and that retail projects resulting in an increase to the region's total VMT may reflect a significant impact. The City and OPR also specify local-serving retail criteria that allow projects below a certain size to be "screened" from quantitative VMT analysis and presumed to result in a less than significant VMT impact. This presumption is based on substantial evidence and research demonstrating that adding local-serving retail uses typically improves destination accessibility to customers, often reducing trip distances (i.e., the, "miles" in vehicle miles traveled) since customers need to travel shorter distances than they previously did. The total demand for retail in a region, or in this case fuel and convenience retail, also tends to hold steady; adding new local-serving retail typically shifts trips away from another provider rather than adding entirely new trips to the region. The City of Santa Rosa has established that local-serving commercial uses under 10,000 square feet in size qualify for this screening criteria.

Because the proposed project is less than 10,000 square feet and would be expected to shift *where* people purchase gas and convenience retail needs rather than increase the amount of gas or convenience goods being sold in the region, it is reasonable to presume that total regional VMT would not increase as a result of the project. The presence of the ten other 7-Elevens and numerous other gas stations and convenience stores in the city also supports the conclusion that the project would indeed function as local-serving retail, with most customers likely traveling from nearby areas of Santa Rosa or making an interim stop along trips they were already making, with little potential to draw longer trips from the wider region. It is therefore reasonable to conclude that the project would have a less-than-significant VMT impact.

**Finding** – The project is anticipated to result in a less-than-significant impact on vehicle miles traveled.

## Intersection Operation

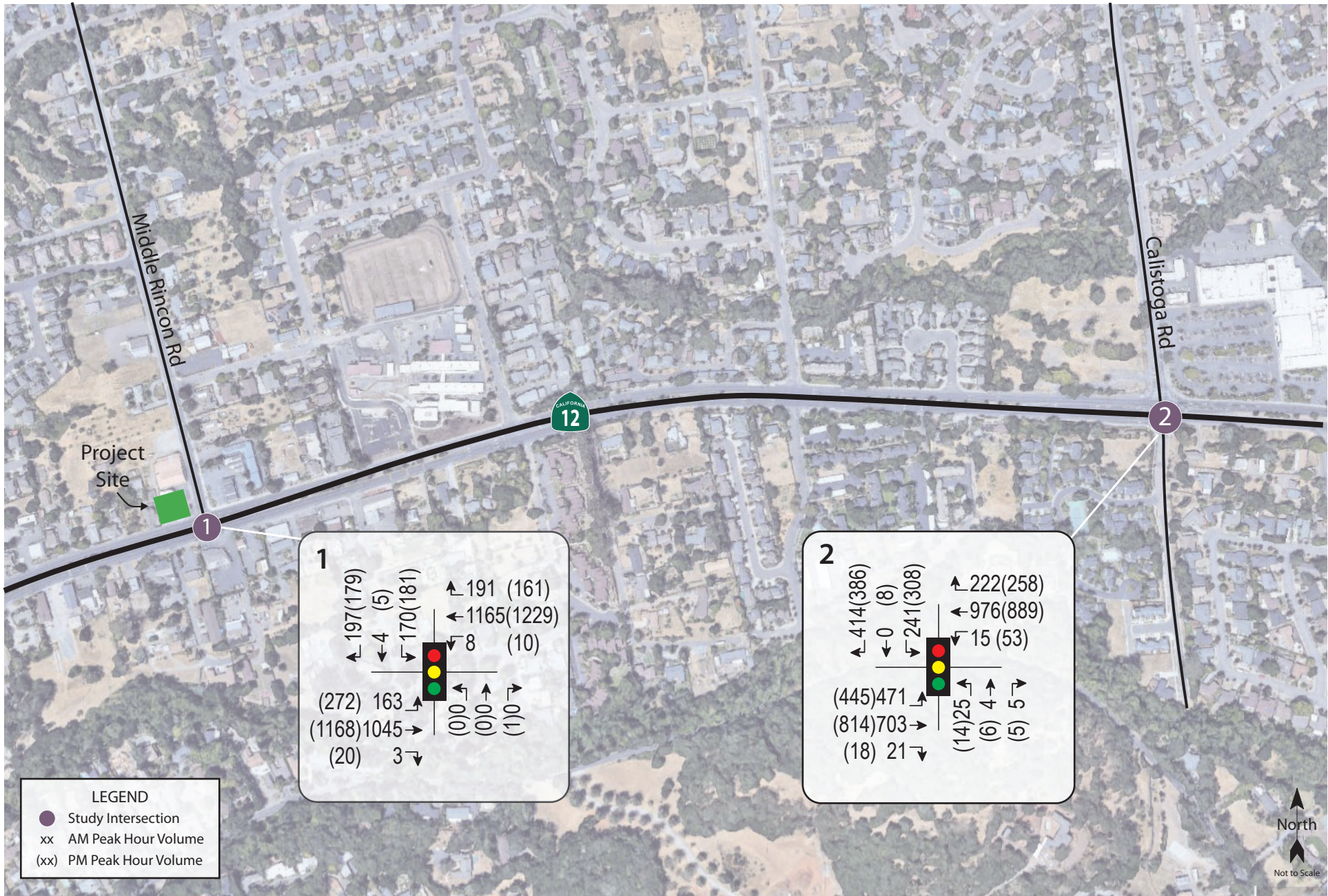
### Existing plus Project Conditions

Upon the addition of project-related traffic to the Existing volumes, the study intersections are expected to operate acceptably. These results are summarized in Table 7 and shown in Figure 6.

| Study Intersection         | Existing Conditions |     |         |     | Existing plus Project |     |         |     |
|----------------------------|---------------------|-----|---------|-----|-----------------------|-----|---------|-----|
|                            | AM Peak             |     | PM Peak |     | AM Peak               |     | PM Peak |     |
|                            | Delay               | LOS | Delay   | LOS | Delay                 | LOS | Delay   | LOS |
| 1. Hwy 12/Middle Rincon Rd | 19.0                | B   | 23.9    | C   | 20.2                  | C   | 24.8    | C   |
| 2. Hwy 12/Calistoga Rd     | 34.3                | C   | 38.8    | D   | 34.6                  | C   | 39.3    | D   |

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

**Finding** – The study intersections are expected to continue operating acceptably at the same Levels of Service upon the addition of project-generated traffic to existing volumes.



Traffic Impact Study for the 7-Eleven at 43 Middle Rincon Road  
**Figure 6 – Existing Plus Project Traffic Volumes**

## Baseline plus Project Conditions

Upon the addition of project-generated traffic to the anticipated Baseline volumes, the study intersections are expected to operate acceptably. The Baseline plus Project operating conditions are summarized in Table 8 and shown in Figure 7.

**Table 8 – Baseline and Baseline plus Project Peak Hour Intersection Levels of Service**

| Study Intersection         | Baseline Conditions |     |         |     | Baseline plus Project |     |         |     |
|----------------------------|---------------------|-----|---------|-----|-----------------------|-----|---------|-----|
|                            | AM Peak             |     | PM Peak |     | AM Peak               |     | PM Peak |     |
|                            | Delay               | LOS | Delay   | LOS | Delay                 | LOS | Delay   | LOS |
| 1. Hwy 12/Middle Rincon Rd | 19.1                | B   | 24.7    | C   | 20.4                  | C   | 25.7    | C   |
| 2. Hwy 12/Calistoga Rd     | 36.8                | D   | 46.8    | D   | 37.2                  | D   | 47.7    | D   |

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

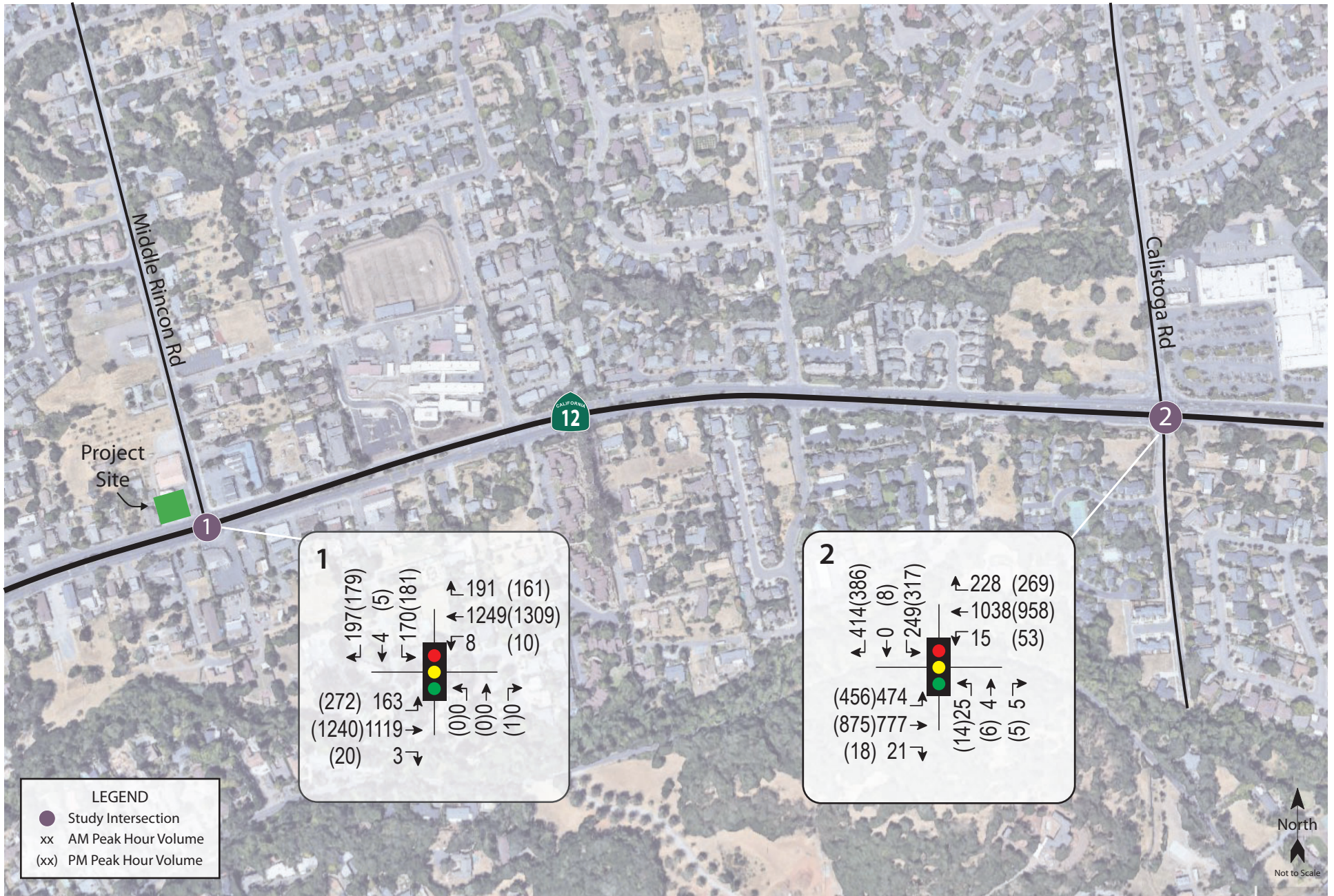
**Finding** – The study intersections will continue operating acceptably with project traffic added to Baseline volumes, at the same Levels of Service as without it.

## Queuing

While quantitative analyses are typically performed to evaluate queuing impacts, qualitative assumptions were instead applied due to the effects the 2020 global pandemic better as known as the Coronavirus (COVID-19) has had on travel patterns. Given that motorists have not traveled at “normal” levels for the majority of the 2020 calendar year, conducting turning movement counts at the project driveways to establish a baseline proved to be impractical for the purposes of this study. As such, historic travel data at adjacent intersections (Montecito Boulevard/Middle Rincon Road – collected in 2016, and Calistoga Road/Highway 12 – collected in 2017) were used to estimate the queue on the southbound Middle Rincon Road approach to Highway 12. Based on this review it is anticipated that the existing storage capacity of four car lengths (the distance along Middle Rincon Road between the driveway apron and Highway 12) would be exceeded and the queue likely block the driveway on Middle Rincon Road during peak periods.

Consideration was given to the potential operational effects of such a blockage. The primary concern would be that a southbound queue blocking the driveway would cause inbound drivers coming from Highway 12 to stop and wait to enter, thereby creating a queue on northbound Middle Rincon Road as through traffic would be unable to pass by. If the queue were to exceed four vehicles, this would result in a safety concern due to traffic backing up into the highway. However, the signal phasing is such that the eastbound left turns onto Middle Rincon Road would follow the green for the southbound approach, so the queue would be cleared out immediately before drivers turning left entered northbound Middle Rincon Road. In other words, the queue would not be at its maximum, but rather at a very limited length when inbound traffic would be coming from the west. Drivers wishing to enter from the east could either go through the green light and then turn into the site from Highway 12 or, if they turned right on red, the southbound approach would have a green light and the queue would be clearing or cleared, allowing access to the driveway.

**Finding** – Existing vehicle queues sometimes block the project driveway on Middle Rincon Road without or with the addition of project-generated traffic. However, because of the signal phasing, the southbound queue at the intersection of Middle Rincon Road/Highway 12 would be expected to clear out prior to eastbound left-turning vehicles entering northbound Middle Rincon Road, allowing drivers to access the project site without delay while there is no southbound queue, thereby also allowing through traffic to proceed with minimal delay.



**Traffic Impact Study for the 7-Eleven at 43 Middle Rincon Road**  
**Figure 7 – Baseline Plus Project Traffic Volumes**

# Alternative Modes

---

## Pedestrian Facilities

Given the proximity of residential neighborhoods and schools within one-quarter mile surrounding the site, it is reasonable to assume that some project patrons and employees will want to walk, bicycle, and/or use transit to reach the project site.

**Project Site** – Sidewalks exist along the project frontages on Middle Rincon Road and Highway 12. Based on the site plan, existing sidewalks along both project frontages are to be repaired as part of the project.

As a part of a set of comments provided by the California Department of Transportation, District 4, staff noted that only one curb ramp currently exists at the north west corner of the intersection of SR12 (Sonoma Highway)/Middle Rincon Rd. Additionally, it was noted that no crosswalk exists across the west leg of the intersection. Caltrans staff has requested that a crosswalk be installed across the west leg of the intersection to enhance pedestrian safety and connectivity along with a curb ramp at the southwest corner.

**Finding** – Planned sidewalk repairs at the project frontages on Highway 12 and Middle Rincon Road, along with existing facilities, are adequate for anticipated demand. Further, it is noted that the installation of a crosswalk as requested by Caltrans and City staff has the potential to reduce access at the driveway on the south side of the intersection of Highway 12 (Sonoma Highway)/Middle Rincon Rd.

**Recommendation** – A crosswalk should be installed at the west leg of the intersection of Highway 12 (Sonoma Highway)/Middle Rincon Road to enhance pedestrian safety and connectivity within the project vicinity.

## Bicycle Facilities

Planned bicycle lanes along Highway 12 and Middle Rincon Road, together with shared use of minor streets provide adequate access for bicyclists. While bicycle facilities are planned along Highway 12 adjacent to the project frontage, it is assumed that the project applicant will contribute development fees to enhance the existing alternative mode facilities within the vicinity of the project.

**Finding** – Bicycle facilities serving the project are adequate.

## Transit

Existing transit routes are acceptable to accommodate project-generated transit trips. Existing bus stops are within an acceptable walking distance of the site; however, a sidewalk gap exists along the south side of Highway 12 west of the intersection with Middle Rincon Road. The sidewalk gap is approximately 115 feet between the intersection of Highway 12/Middle Rincon Road and SCT bus stop #7724500 and consists of a gravel path adjacent to developed properties. As this gap in sidewalk facilities is not along or even adjacent to the proposed project site it is assumed the onus to improve transit access at that location is the responsibility of others.

Additionally, the project applicant is proposing to relocate SCT bus stop #7736100 from a near-side stop east of Middle Rincon Road, to a far-side stop approximately 150 feet west of the intersection at Middle Rincon Road. The relocated bus stop would include a 60-foot turn-out adjacent to the project driveway which provides access to Highway 12. The relocation of the bus stop, along with the addition of the bus turn-out, will improve the safety and efficiency of transit service along Highway 12. Further, the construction of a new crosswalk across Highway 12 will allow for increased pedestrian access to and from the relocated bus stop.

**Finding** – Existing and proposed transit facilities serving the project site are adequate; however, there is a gap in sidewalk facilities on the south side of Highway 12 west of the intersection with Middle Rincon Road.

**Recommendation** – The sidewalk gap on the south side of Highway 12 west of the intersection with Middle Rincon Road should be closed by others to enhance connectivity to transit facilities.



# Access and Circulation

---

## Site Access

Access to the project site is provided by two driveways, one on Middle Rincon Road and the other on Highway 12; both of which will be relocated, as shown in the site plan. The driveway on Middle Rincon is a full access driveway and the driveway on Highway 12 is restricted to right-turns in and out. The driveways are both approximately 35 feet wide. Driveways of this width would be expected to provide ample space to allow an emergency vehicle to enter and exit the project site safely.

## Vehicular Circulation

The proposed project site is located at the northwest corner of Highway 12/Middle Rincon Road. Highway 12 generally runs in an east-west direction in the City of Santa Rosa. East of Farmers Lane and within City Limits it is classified as an arterial street. Along the project frontage, the road has two 12-foot travel lanes in each direction, with a raised median dividing the two directions of travel. The segment fronting the project site has a posted speed limit of 45 mph. Middle Rincon Road runs in a north-south direction and is classified as an arterial in the City of Santa Rosa. Along the project frontage, the road has one 12-foot travel lane in each direction, with a posted speed limit of 35 mph.

## Sight Distance

Sight distances along Highway 12 and Middle Rincon Road at the existing driveways were evaluated based on sight distance criteria contained in the *Highway Design Manual, 6<sup>th</sup> Edition* published by Caltrans. The recommended sight distances along both streets at the private project driveways are based on stopping sight distance.

Based on a design speed of 45 mph on Highway 12, the minimum stopping sight distance needed is 360 feet. Since vehicles at this driveway can only turn right in or out, sight distance of vehicles traveling westbound were observed. Field observations indicate that sight lines extend more than 360 feet along Highway 12, which is adequate to meet the required sight distance. Further, while there are existing signs and power lines on the northwest corner of Highway 12/Middle Rincon Road, sight lines to vehicles turning right off Middle Rincon Road are also adequate.

Based on the design speed of 35 mph on Middle Rincon Road, the minimum stopping sight distance needed is 250 feet. Sight lines extended approximately 330 feet to the north of the driveway. While the intersection of Highway 12/Middle Rincon Road is approximately 100 feet to the south of the driveway, existing sight lines of vehicles turning onto Middle Rincon Road are adequate, especially given the lower speeds of these turning movements.

To maintain adequate sight lines, it is recommended that any signage or landscaping planned near either driveway be outside of the driver's vision triangle. Additionally, any project signage or landscaping at the northeast corner of Highway 12/Middle Rincon Road should not inhibit existing visibility of the intersection from the driveways.

**Finding** – Sight distance is adequate at both existing driveways based on the posted speed limits.

**Recommendation** – The applicant should design any project signage or landscaping to remain outside of the driver's vision triangle to maintain adequate sight lines.

# Parking

## Vehicle Parking

The project was analyzed to determine whether the proposed parking supply would satisfy local standards. The project site as proposed would provide a total of 20 parking spaces for the 4,191 square foot convenience market.

Jurisdiction parking supply requirements are based on the City of Santa Rosa City Code, Chapter 20-36.040; Number of Parking Spaces Required. The municipal code requires retail developments to provide parking at a rate of one space per 250 square feet of gross leasable area. Under the City’s code, 17 spaces would be required for the 4,191 square foot convenience market. Two additional parking spaces are needed for employees, resulting in a total of required supply of 19 spaces.

The proposed parking supply exceeds the number of parking spaces required with a surplus of one space. The proposed parking supply and City of Santa Rosa requirements are shown in Table 9.

| Table 9 – Parking Analysis Summary |                   |                 |                                               |                 |
|------------------------------------|-------------------|-----------------|-----------------------------------------------|-----------------|
| Land Use                           | Units             | Supply (spaces) | City Requirements                             |                 |
|                                    |                   |                 | Rate                                          | Spaces Required |
| Retail/Gas Station                 | 4,193 square feet | 20              | 1 space per 250 square feet                   | 17              |
|                                    | 2 Employees       |                 | 1 space per service bay; 1 space per employee | 2               |
| <b>Total</b>                       |                   | <b>20</b>       |                                               | <b>19</b>       |

**Finding** – The proposed parking supply exceeds the spaces required under the City’s code by one space.

## Bicycle Parking

The project site plan identifies the provision of bicycle parking reflecting one long-term space and three short-term spaces for a total of four bicycle parking spaces.

The City of Santa Rosa’s City Code stipulates the City’s bicycle parking requirements for new developments. According to the City of Santa Rosa City Code, bicycle parking is required for retail developments at a ratio of one space per 5,000 square feet. Additionally, Zoning Code Section 20-36.090, requires a minimum of two short-term and one long-term space for all new non-residential development. At 4,193 square feet the proposed project would require three spaces; the proposed supply of four spaces exceeds this minimum requirement by one space.

**Finding** – Bicycle storage is included within the proposed plan and exceeds the required number of spaces by one space. As such, the proposed number of bicycle parking is expected to be adequate.

# Conclusions and Recommendations

---

## Conclusions

- The study intersections operate acceptably overall during both peak hours under existing conditions and would be expected to continue doing so with traffic from nearby approved and proposed projects added.
- After deductions are applied for the existing convenience market, which will be demolished for the construction of the proposed project, and with appropriate pass-by rates applied to both uses, the project would generate 749 more primary daily trips than the existing use, including 60 trips during the a.m. peak hour, and 41 p.m. peak hour primary trips.
- The project would have a less-than-significant impact on VMT.
- Queuing on southbound Middle Rincon Road is expected to sometimes block access into the project site during peak periods, though the maximum queue would occur during the part of the signal cycle when only westbound drivers could arrive at the site, and those trips could be served directly from Highway 12.
- With planned improvements to existing sidewalks along the project's frontages, pedestrian facilities serving the site would be adequate. Existing and planned bicycle facilities, as well as existing transit facilities, serving the site are adequate for the anticipated demand.
- The project applicant is proposing to relocate the SCT bus stop on Highway 12 near Middle Rincon Road from a near-side stop to a far-side bus stop west of the intersection.
- The installation of a crosswalk on the west leg of the intersection of Highway 12 (Sonoma Highway)/Middle Rincon Road would further enhance pedestrian safety and connectivity within the project vicinity.
- Existing sight lines at both the driveways are adequate.
- The proposed parking supply for both vehicles and bicycles meets the requirements of the City's City Code.

## Recommendations

- It is recommended that any planned landscaping or signage at the driveways or the northeast corner of Highway 12/Middle Rincon Road be placed outside the driver's sight lines to maintain existing visibility.
- A crosswalk should be installed on the west leg of the intersection of Highway 12 (Sonoma Highway)/Middle Rincon Road to enhance pedestrian safety and connectivity within the project vicinity.
- The gap in sidewalk facilities on the south side of Highway 12 west of the intersection with Middle Rincon Road should be closed by others to enhance connectivity to transit facilities.
- The existing bus stop east of the project site on Highway 12 should be moved to west of Middle Rincon Road and a pull-out constructed along the project's frontage, as proposed.

# Study Participants and References

---

## Study Participants

|                            |                                     |
|----------------------------|-------------------------------------|
| <b>Principal in Charge</b> | Dalene J. Whitlock, PE, PTOE        |
| <b>Associate Planner</b>   | Andre Huff                          |
| <b>Assistant Engineer</b>  | Kimberly Tellez                     |
| <b>Graphics</b>            | Cameron Wong                        |
| <b>Editing/Formatting</b>  | Alex Scrobonia, Hannah Yung-Boxdell |
| <b>Quality Control</b>     | Dalene J. Whitlock, PE, PTOE        |

## References

- 2016 Collision Data on California State SRs*, California Department of Transportation, 2018
- California Manual on Uniform Traffic Control Devices for Streets and Highways*, California Department of Transportation, 2014
- California Vehicle Code*, State of California, 2018,  
[http://leginfo.ca.gov/faces/codesTOCSelected.xhtml?tocCode=VEH&tocTitle="+Vehicle+Code++VEH](http://leginfo.ca.gov/faces/codesTOCSelected.xhtml?tocCode=VEH&tocTitle=)
- City of Santa Rosa Bicycle & Pedestrian Master Plan Update 2018*, City of Santa Rosa, 2018
- Highway Capacity Manual*, Transportation Research Board, 2000
- Highway Capacity Manual*, Transportation Research Board, 2010
- Highway Design Manual*, 6<sup>th</sup> Edition, California Department of Transportation, 2017
- Santa Rosa City Code*, Quality Code Publishing, 2017
- Santa Rosa CityBus, <http://srcity.org/1661/Maps-and-Schedules>
- Santa Rosa General Plan 2035*, City of Santa Rosa, 2014
- Sonoma County Transit, <http://sctransit.com/>
- Statewide Integrated Traffic Records System (SWITRS)*, California Highway Patrol, 2014-2019
- Technical Advisory on Evaluating Transportation Impacts in CEQA*, Governor's Office of Planning and Research, 2018
- Trip Generation Manual*, 10<sup>th</sup> Edition, Institute of Transportation Engineers, 2017
- Vehicle Miles Traveled-Focused Transportation Impact Study Guide*, California Department of Transportation, 2020

SRO538



# Appendix A

---

## Collision Rate Calculations



**This page intentionally left blank**

### Intersection Collision Rate Worksheet

#### TIS for the 7-Eleven Project at 43 Middle Rincon Road

**Intersection # 1:** SR 12 & Middle Rincon Road

**Date of Count:** Saturday, January 0, 1900

**Number of Collisions:** 20

**Number of Injuries:** 11

**Number of Fatalities:** 1

**Average Daily Traffic (ADT):** 27300

**Start Date:** September 1, 2014

**End Date:** August 31, 2019

**Number of Years:** 5

**Intersection Type:** Four-Legged

**Control Type:** Signals

**Area:** Suburban

$$\text{Collision Rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times \text{Days per Year} \times \text{Number of Years}}$$

$$\text{Collision Rate} = \frac{20}{27,300} \times \frac{1,000,000}{365 \times 5}$$

|                           | Collision Rate    | Fatality Rate | Injury Rate  |
|---------------------------|-------------------|---------------|--------------|
| <b>Study Intersection</b> | <b>0.40 c/mve</b> | <b>5.0%</b>   | <b>55.0%</b> |
| <b>Statewide Average*</b> | <b>0.43 c/mve</b> | <b>0.4%</b>   | <b>36.1%</b> |

**Notes**

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

**Intersection # 2:** SR 12 & Calistoga Road

**Date of Count:** Thursday, April 27, 2017

**Number of Collisions:** 17

**Number of Injuries:** 7

**Number of Fatalities:** 2

**Average Daily Traffic (ADT):** 26000

**Start Date:** September 1, 2014

**End Date:** August 31, 2019

**Number of Years:** 5

**Intersection Type:** Four-Legged

**Control Type:** Signals

**Area:** Suburban

$$\text{Collision Rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times \text{Days per Year} \times \text{Number of Years}}$$

$$\text{Collision Rate} = \frac{17}{26,000} \times \frac{1,000,000}{365 \times 5}$$

|                           | Collision Rate    | Fatality Rate | Injury Rate  |
|---------------------------|-------------------|---------------|--------------|
| <b>Study Intersection</b> | <b>0.36 c/mve</b> | <b>11.8%</b>  | <b>41.2%</b> |
| <b>Statewide Average*</b> | <b>0.43 c/mve</b> | <b>0.4%</b>   | <b>36.1%</b> |

**Notes**

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



**This page intentionally left blank**



# Appendix B

---

## Intersection Level of Service Calculations



**This page intentionally left blank**

HCM Signalized Intersection Capacity Analysis  
1: Sonoma Hwy (SR 12) & Middle Rincon Road

11/09/2020

| Movement                          | EBL   | EBT  | EBR  | WBL                       | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-----------------------------------|-------|------|------|---------------------------|-------|------|------|------|------|------|------|------|
| Lane Configurations               | ↔     | ↕    | ↔    | ↔                         | ↕     | ↔    |      |      |      |      | ↕    | ↕    |
| Traffic Volume (vph)              | 150   | 1045 | 3    | 8                         | 1165  | 178  | 0    | 0    | 0    | 157  | 4    | 197  |
| Future Volume (vph)               | 150   | 1045 | 3    | 8                         | 1165  | 178  | 0    | 0    | 0    | 157  | 4    | 197  |
| Ideal Flow (vphpl)                | 1900  | 1900 | 1900 | 1900                      | 1900  | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)               | 4.7   | 5.8  |      | 4.7                       | 5.8   |      |      |      |      |      |      | 5.1  |
| Lane Util. Factor                 | 1.00  | 0.95 |      | 1.00                      | 0.95  |      |      |      |      |      |      | 0.95 |
| Fr't                              | 1.00  | 1.00 |      | 1.00                      | 0.98  |      |      |      |      |      |      | 0.92 |
| Flt Protected                     | 0.95  | 1.00 |      | 0.95                      | 1.00  |      |      |      |      |      |      | 0.98 |
| Sat'd. Flow (prot)                | 1770  | 3538 |      | 1770                      | 3469  |      |      |      |      |      |      | 3177 |
| Flt Permitted                     | 0.95  | 1.00 |      | 0.95                      | 1.00  |      |      |      |      |      |      | 0.98 |
| Sat'd. Flow (perm)                | 1770  | 3538 |      | 1770                      | 3469  |      |      |      |      |      |      | 3177 |
| 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)                   | 158   | 1100 | 3    | 8                         | 1226  | 187  | 0    | 0    | 0    | 165  | 4    | 207  |
| RTOR Reduction (vph)              | 0     | 0    | 0    | 0                         | 7     | 0    | 0    | 0    | 0    | 0    | 0    | 167  |
| Lane Group Flow (vph)             | 158   | 1103 | 0    | 8                         | 1406  | 0    | 0    | 0    | 0    | 0    | 0    | 209  |
| Turn Type                         | Prot  | NA   |      | Prot                      | NA    |      |      |      |      | Perm | NA   |      |
| Protected Phases                  | 5     | 2    |      | 1                         | 6     |      |      |      |      |      | 4    |      |
| Permitted Phases                  | 4     |      |      |                           |       |      |      |      |      |      |      |      |
| Actuated Green, G (s)             | 17.6  | 67.3 |      | 3.3                       | 53.0  |      |      |      |      |      |      | 12.8 |
| Effective Green, g (s)            | 17.6  | 67.3 |      | 3.3                       | 53.0  |      |      |      |      |      |      | 12.8 |
| Actuated g/C Ratio                | 0.18  | 0.68 |      | 0.03                      | 0.54  |      |      |      |      |      |      | 0.13 |
| Clearance Time (s)                | 4.7   | 5.8  |      | 4.7                       | 5.8   |      |      |      |      |      |      | 5.1  |
| Vehicle Extension (s)             | 2.0   | 4.5  |      | 2.0                       | 4.5   |      |      |      |      |      |      | 2.0  |
| Lane Grp Cap (vph)                | 314   | 2405 |      | 59                        | 1857  |      |      |      |      |      |      | 410  |
| v/s Ratio Prot                    | c0.09 | 0.31 |      | 0.00                      | c0.41 |      |      |      |      |      |      | 0.07 |
| v/s Ratio Perm                    | 0.07  |      |      |                           |       |      |      |      |      |      |      |      |
| v/c Ratio                         | 0.50  | 0.46 |      | 0.14                      | 0.76  |      |      |      |      |      |      | 0.51 |
| Uniform Delay, d1                 | 36.8  | 7.4  |      | 46.5                      | 18.0  |      |      |      |      |      |      | 40.2 |
| Progression Factor                | 1.00  | 1.00 |      | 1.00                      | 1.00  |      |      |      |      |      |      | 1.00 |
| Incremental Delay, d2             | 0.5   | 0.2  |      | 0.4                       | 2.0   |      |      |      |      |      |      | 0.4  |
| Delay (s)                         | 37.2  | 7.6  |      | 46.8                      | 20.0  |      |      |      |      |      |      | 40.5 |
| Level of Service                  | D     | A    |      | D                         | C     |      |      |      |      |      |      | D    |
| Approach Delay (s)                | 11.3  |      |      |                           | 20.2  |      | 0.0  |      |      |      | 40.5 |      |
| Approach LOS                      | B     |      |      |                           | C     |      | A    |      |      |      | D    |      |
| <b>Intersection Summary</b>       |       |      |      |                           |       |      |      |      |      |      |      |      |
| HCM 2000 Control Delay            | 19.0  |      |      | HCM 2000 Level of Service |       |      | B    |      |      |      |      |      |
| HCM 2000 Volume to Capacity ratio | 0.71  |      |      |                           |       |      |      |      |      |      |      |      |
| Actuated Cycle Length (s)         | 99.0  |      |      | Sum of lost time (s)      |       |      | 20.3 |      |      |      |      |      |
| Intersection Capacity Utilization | 70.2% |      |      | ICU Level of Service      |       |      | C    |      |      |      |      |      |
| Analysis Period (min)             | 15    |      |      |                           |       |      |      |      |      |      |      |      |
| c Critical Lane Group             |       |      |      |                           |       |      |      |      |      |      |      |      |

HCM 2010 Signalized Intersection Summary  
2: Calistoga Road & Sonoma Hwy (SR 12)

11/09/2020

| Movement                     | EBL   | EBT  | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------------|-------|------|------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations          | ↔     | ↕    | ↔    | ↔    | ↕     | ↔    |      |      |      |      | ↕    | ↕    |
| Traffic Volume (veh/h)       | 471   | 690  | 21   | 15   | 963   | 222  | 25   | 4    | 5    | 241  | 0    | 414  |
| Future Volume (veh/h)        | 471   | 690  | 21   | 15   | 963   | 222  | 25   | 4    | 5    | 241  | 0    | 414  |
| Number                       | 5     | 2    | 12   | 1    | 6     | 16   | 3    | 8    | 18   | 7    | 4    | 14   |
| Initial Q (Qb), veh          | 0     | 0    | 0    | 0    | 0     | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Ped-Bike Adj(A_pbT)          | 1.00  |      | 0.98 | 1.00 |       | 0.99 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj             | 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 Sat Flow, veh/h/ln       | 1845  | 1810 | 1863 | 1863 | 1816  | 1900 | 1900 | 1863 | 1900 | 1900 | 1845 | 1845 |
| Adj Flow Rate, veh/h         | 486   | 711  | 14   | 15   | 993   | 130  | 26   | 4    | 3    | 248  | 0    | 263  |
| Adj No. of Lanes             | 2     | 2    | 1    | 1    | 2     | 0    | 0    | 1    | 0    | 0    | 1    | 1    |
| 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 |
| Percent Heavy Veh, %         | 3     | 5    | 2    | 2    | 5     | 5    | 2    | 2    | 2    | 2    | 2    | 3    |
| Cap, veh/h                   | 559   | 1811 | 816  | 54   | 1204  | 158  | 105  | 16   | 12   | 291  | 0    | 517  |
| Arrive On Green              | 0.16  | 0.53 | 0.53 | 0.03 | 0.39  | 0.39 | 0.08 | 0.08 | 0.08 | 0.17 | 0.00 | 0.17 |
| Sat Flow, veh/h              | 3408  | 3438 | 1548 | 1774 | 3063  | 401  | 1390 | 214  | 160  | 1757 | 0    | 1568 |
| Grp Volume(v), veh/h         | 486   | 711  | 14   | 15   | 559   | 564  | 33   | 0    | 0    | 248  | 0    | 263  |
| Grp Sat Flow(s),veh/h/ln     | 1704  | 1719 | 1548 | 1774 | 1725  | 1739 | 1764 | 0    | 0    | 1757 | 0    | 1568 |
| Q Serve(g_s), s              | 14.2  | 12.6 | 0.4  | 0.8  | 29.8  | 29.8 | 1.8  | 0.0  | 0.0  | 14.1 | 0.0  | 13.8 |
| Cycle Q Clear(g_c), s        | 14.2  | 12.6 | 0.4  | 0.8  | 29.8  | 29.8 | 1.8  | 0.0  | 0.0  | 14.1 | 0.0  | 13.8 |
| Prop In Lane                 | 1.00  | 1.00 | 1.00 | 1.00 | 0.23  | 0.79 |      |      | 0.09 | 1.00 |      | 1.00 |
| Lane Grp Cap(c), veh/h       | 559   | 1811 | 816  | 54   | 678   | 684  | 133  | 0    | 0    | 291  | 0    | 517  |
| V/C Ratio(X)                 | 0.87  | 0.39 | 0.02 | 0.28 | 0.82  | 0.82 | 0.25 | 0.00 | 0.00 | 0.85 | 0.00 | 0.51 |
| Avail Cap(c_a), veh/h        | 642   | 1959 | 882  | 156  | 810   | 816  | 618  | 0    | 0    | 341  | 0    | 562  |
| HCM Platoon Ratio            | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I)           | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh     | 41.7  | 14.5 | 11.6 | 48.6 | 27.9  | 27.9 | 44.7 | 0.0  | 0.0  | 41.5 | 0.0  | 27.7 |
| Incr Delay (d2), s/veh       | 11.1  | 0.2  | 0.0  | 2.7  | 6.6   | 6.6  | 1.0  | 0.0  | 0.0  | 16.5 | 0.0  | 0.8  |
| Initial Q Delay(d3),s/veh    | 0.0   | 0.0  | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| %ile BackOfQ(50%),veh/ln     | 7.5   | 6.0  | 0.2  | 0.5  | 15.4  | 15.5 | 0.9  | 0.0  | 0.0  | 8.2  | 0.0  | 6.1  |
| LnGrp Delay(d),s/veh         | 52.8  | 14.7 | 11.6 | 51.3 | 34.5  | 34.5 | 45.6 | 0.0  | 0.0  | 58.0 | 0.0  | 28.4 |
| LnGrp LOS                    | D     | B    | B    | D    | C     | C    | D    |      |      | E    |      | C    |
| Approach Vol, veh/h          | 1211  |      |      |      | 1138  |      | 33   |      |      |      | 511  |      |
| Approach Delay, s/veh        | 30.0  |      |      |      | 34.7  |      | 45.6 |      |      |      | 42.8 |      |
| Approach LOS                 | C     |      |      |      | C     |      | D    |      |      |      | D    |      |
| <b>Timer</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |
| Assigned Phs                 | 1     | 2    | 3    | 4    | 5     | 6    | 7    | 8    |      |      |      |      |
| Phs Duration (G+Y+Rc), s     | 7.8   | 59.8 |      | 22.1 | 21.5  | 46.1 | 12.8 |      |      |      |      |      |
| Change Period (Y+Rc), s      | * 4.7 | 5.8  |      | 5.1  | * 4.7 | 5.8  | 5.1  |      |      |      |      |      |
| Max Green Setting (Gmax), s  | * 9   | 58.4 |      | 19.9 | * 19  | 48.1 | 35.9 |      |      |      |      |      |
| Max Q Clear Time (g_c+I1), s | 2.8   | 14.6 |      | 16.1 | 16.2  | 31.8 | 3.8  |      |      |      |      |      |
| Green Ext Time (p_c), s      | 0.0   | 7.6  |      | 0.9  | 0.6   | 8.4  | 0.1  |      |      |      |      |      |
| <b>Intersection Summary</b>  |       |      |      |      |       |      |      |      |      |      |      |      |
| HCM 2010 Ctrl Delay          | 34.3  |      |      |      |       |      |      |      |      |      |      |      |
| HCM 2010 LOS                 | C     |      |      |      |       |      |      |      |      |      |      |      |
| <b>Notes</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |

HCM Signalized Intersection Capacity Analysis  
1: Sonoma Hwy (SR 12) & Middle Rincon Road

11/09/2020

| Movement                          | EBL   | EBT  | EBR                       | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-----------------------------------|-------|------|---------------------------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations               |       |      |                           |      |       |      |      |      |      |      |      |      |
| Traffic Volume (vph)              | 263   | 1168 | 20                        | 10   | 1229  | 152  | 0    | 0    | 1    | 172  | 5    | 179  |
| Future Volume (vph)               | 263   | 1168 | 20                        | 10   | 1229  | 152  | 0    | 0    | 1    | 172  | 5    | 179  |
| Ideal Flow (vphpl)                | 1900  | 1900 | 1900                      | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)               | 4.7   | 5.8  |                           | 4.7  | 5.8   |      |      | 4.0  |      |      | 5.1  |      |
| Lane Util. Factor                 | 1.00  | 0.95 |                           | 1.00 | 0.95  |      |      | 1.00 |      |      | 0.95 |      |
| Frt                               | 1.00  | 1.00 |                           | 1.00 | 0.98  |      |      | 0.85 |      |      | 0.92 |      |
| Flt Protected                     | 0.95  | 1.00 |                           | 0.95 | 1.00  |      |      | 1.00 |      |      | 0.98 |      |
| Satd. Flow (prot)                 | 1770  | 3530 |                           | 1770 | 3481  |      |      | 0    |      |      | 3195 |      |
| Flt Permitted                     | 0.95  | 1.00 |                           | 0.95 | 1.00  |      |      | 1.00 |      |      | 0.98 |      |
| Satd. Flow (perm)                 | 1770  | 3530 |                           | 1770 | 3481  |      |      | 0    |      |      | 3195 |      |
| Peak-hour factor, PHF             | 0.93  | 0.93 | 0.93                      | 0.93 | 0.93  | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)                   | 283   | 1256 | 22                        | 11   | 1322  | 163  | 0    | 0    | 1    | 185  | 5    | 192  |
| RTOR Reduction (vph)              | 0     | 0    | 0                         | 0    | 5     | 0    | 0    | 1    | 0    | 0    | 134  | 0    |
| Lane Group Flow (vph)             | 283   | 1278 | 0                         | 11   | 1480  | 0    | 0    | 0    | 0    | 0    | 248  | 0    |
| Turn Type                         | Prot  | NA   |                           | Prot | NA    |      |      |      |      | Perm | NA   |      |
| Protected Phases                  | 5     | 2    |                           | 1    | 6     |      |      |      |      |      | 4    |      |
| Permitted Phases                  | 4     |      |                           |      |       |      |      |      |      |      |      |      |
| Actuated Green, G (s)             | 23.0  | 79.8 |                           | 3.4  | 60.2  |      |      | 0.0  |      |      | 15.3 |      |
| Effective Green, g (s)            | 23.0  | 79.8 |                           | 3.4  | 60.2  |      |      | 0.0  |      |      | 15.3 |      |
| Actuated g/C Ratio                | 0.20  | 0.70 |                           | 0.03 | 0.53  |      |      | 0.00 |      |      | 0.13 |      |
| Clearance Time (s)                | 4.7   | 5.8  |                           | 4.7  | 5.8   |      |      |      |      |      | 5.1  |      |
| Vehicle Extension (s)             | 3.0   | 3.0  |                           | 3.0  | 3.0   |      |      |      |      |      | 3.0  |      |
| Lane Grp Cap (vph)                | 356   | 2468 |                           | 52   | 1836  |      |      | 0    |      |      | 428  |      |
| v/s Ratio Prot                    | c0.16 | 0.36 |                           | 0.01 | c0.43 |      |      |      |      |      | 0.08 |      |
| v/s Ratio Perm                    | 0.08  |      |                           |      |       |      |      |      |      |      |      |      |
| v/c Ratio                         | 0.79  | 0.52 |                           | 0.21 | 0.81  |      |      | 0.00 |      |      | 0.58 |      |
| Uniform Delay, d1                 | 43.3  | 8.1  |                           | 54.0 | 22.2  |      |      | 57.0 |      |      | 46.4 |      |
| Progression Factor                | 1.00  | 1.00 |                           | 1.00 | 1.00  |      |      | 1.00 |      |      | 1.00 |      |
| Incremental Delay, d2             | 11.6  | 0.2  |                           | 2.0  | 2.7   |      |      | 0.0  |      |      | 1.9  |      |
| Delay (s)                         | 54.9  | 8.3  |                           | 56.1 | 24.8  |      |      | 57.0 |      |      | 48.3 |      |
| Level of Service                  | D     | A    |                           | E    | C     |      |      | E    |      |      | D    |      |
| Approach Delay (s)                | 16.7  |      |                           |      | 25.1  |      |      |      | 57.0 |      | 48.3 |      |
| Approach LOS                      | B     |      |                           |      | C     |      |      |      | E    |      | D    |      |
| <b>Intersection Summary</b>       |       |      |                           |      |       |      |      |      |      |      |      |      |
| HCM 2000 Control Delay            | 23.9  |      | HCM 2000 Level of Service |      | C     |      |      |      |      |      |      |      |
| HCM 2000 Volume to Capacity ratio | 0.81  |      |                           |      |       |      |      |      |      |      |      |      |
| Actuated Cycle Length (s)         | 114.1 |      | Sum of lost time (s)      |      | 20.3  |      |      |      |      |      |      |      |
| Intersection Capacity Utilization | Err%  |      | ICU Level of Service      |      | H     |      |      |      |      |      |      |      |
| Analysis Period (min)             | 15    |      |                           |      |       |      |      |      |      |      |      |      |
| c Critical Lane Group             |       |      |                           |      |       |      |      |      |      |      |      |      |

HCM 2010 Signalized Intersection Summary  
2: Calistoga Road & Sonoma Hwy (SR 12)

11/09/2020

| Movement                     | EBL   | EBT  | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------------|-------|------|------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations          |       |      |      |      |       |      |      |      |      |      |      |      |
| Traffic Volume (veh/h)       | 445   | 805  | 18   | 53   | 880   | 258  | 14   | 6    | 5    | 308  | 8    | 386  |
| Future Volume (veh/h)        | 445   | 805  | 18   | 53   | 880   | 258  | 14   | 6    | 5    | 308  | 8    | 386  |
| Number                       | 5     | 2    | 12   | 1    | 6     | 16   | 3    | 8    | 18   | 7    | 4    | 14   |
| Initial Q (Qb), veh          | 0     | 0    | 0    | 0    | 0     | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Ped-Bike Adj(A_pbT)          | 1.00  |      | 0.98 | 1.00 |       | 0.99 | 1.00 |      | 0.99 | 1.00 |      | 1.00 |
| Parking Bus, Adj             | 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 Sat Flow, veh/h/ln       | 1845  | 1810 | 1863 | 1863 | 1817  | 1900 | 1900 | 1863 | 1900 | 1900 | 1845 | 1845 |
| Adj Flow Rate, veh/h         | 459   | 830  | 16   | 55   | 907   | 141  | 14   | 6    | 3    | 318  | 8    | 273  |
| Adj No. of Lanes             | 2     | 2    | 1    | 1    | 2     | 0    | 0    | 1    | 0    | 0    | 1    | 1    |
| 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 |
| Percent Heavy Veh, %         | 3     | 5    | 2    | 2    | 5     | 5    | 2    | 2    | 2    | 2    | 2    | 3    |
| Cap, veh/h                   | 557   | 1424 | 641  | 131  | 969   | 151  | 76   | 32   | 16   | 373  | 9    | 597  |
| Arrive On Green              | 0.16  | 0.41 | 0.41 | 0.07 | 0.32  | 0.32 | 0.07 | 0.07 | 0.07 | 0.22 | 0.22 | 0.22 |
| Sat Flow, veh/h              | 3408  | 3438 | 1547 | 1774 | 2989  | 465  | 1075 | 461  | 230  | 1716 | 43   | 1568 |
| Grp Volume(v), veh/h         | 459   | 830  | 16   | 55   | 524   | 524  | 23   | 0    | 0    | 326  | 0    | 273  |
| Grp Sat Flow(s),veh/h/ln     | 1704  | 1719 | 1547 | 1774 | 1727  | 1727 | 1766 | 0    | 0    | 1759 | 0    | 1568 |
| Q Serve(g_s), s              | 12.0  | 17.2 | 0.6  | 2.7  | 27.1  | 27.2 | 1.1  | 0.0  | 0.0  | 16.4 | 0.0  | 12.0 |
| Cycle Q Clear(g_c), s        | 12.0  | 17.2 | 0.6  | 2.7  | 27.1  | 27.2 | 1.1  | 0.0  | 0.0  | 16.4 | 0.0  | 12.0 |
| Prop In Lane                 | 1.00  |      | 1.00 | 1.00 |       | 0.27 | 0.61 |      | 0.13 | 0.98 |      | 1.00 |
| Lane Grp Cap(c), veh/h       | 557   | 1424 | 641  | 131  | 560   | 560  | 124  | 0    | 0    | 382  | 0    | 597  |
| V/C Ratio(X)                 | 0.82  | 0.58 | 0.02 | 0.42 | 0.94  | 0.94 | 0.19 | 0.00 | 0.00 | 0.85 | 0.00 | 0.46 |
| Avail Cap(c_a), veh/h        | 824   | 1573 | 708  | 198  | 565   | 566  | 688  | 0    | 0    | 475  | 0    | 680  |
| HCM Platoon Ratio            | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I)           | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh     | 37.3  | 20.9 | 16.0 | 40.8 | 30.2  | 30.2 | 40.4 | 0.0  | 0.0  | 34.7 | 0.0  | 21.4 |
| Incr Delay (d2), s/veh       | 4.4   | 0.6  | 0.0  | 2.1  | 23.3  | 23.3 | 0.7  | 0.0  | 0.0  | 11.7 | 0.0  | 0.5  |
| Initial Q Delay(d3),s/veh    | 0.0   | 0.0  | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| %ile BackOfQ(50%),veh/ln     | 6.0   | 8.2  | 0.2  | 1.4  | 16.6  | 16.6 | 0.6  | 0.0  | 0.0  | 9.2  | 0.0  | 5.3  |
| LnGrp Delay(d),s/veh         | 41.6  | 21.5 | 16.0 | 43.0 | 53.5  | 53.5 | 41.1 | 0.0  | 0.0  | 46.4 | 0.0  | 21.9 |
| LnGrp LOS                    | D     | C    | B    | D    | D     | D    | D    | D    | D    | D    | D    | C    |
| Approach Vol, veh/h          | 1305  |      |      | 1103 |       |      | 23   |      |      | 599  |      |      |
| Approach Delay, s/veh        | 28.5  |      |      | 53.0 |       |      | 41.1 |      |      | 35.3 |      |      |
| Approach LOS                 | C     |      |      | D    |       |      | D    |      |      | D    |      |      |
| <b>Timer</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |
| Assigned Phs                 | 1     | 2    | 3    | 4    | 5     | 6    | 7    | 8    |      |      |      |      |
| Phs Duration (G+Y+Rc), s     | 11.5  | 44.0 |      | 25.1 | 19.8  | 35.7 |      | 11.6 |      |      |      |      |
| Change Period (Y+Rc), s      | * 4.7 | 5.8  |      | 5.1  | * 4.7 | 5.8  |      | 5.1  |      |      |      |      |
| Max Green Setting (Gmax), s  | * 10  | 42.2 |      | 24.9 | * 22  | 30.2 |      | 35.9 |      |      |      |      |
| Max Q Clear Time (g_c+1t), s | 4.7   | 19.2 |      | 18.4 | 14.0  | 29.2 |      | 3.1  |      |      |      |      |
| Green Ext Time (p_c), s      | 0.0   | 7.8  |      | 1.6  | 1.1   | 0.8  |      | 0.1  |      |      |      |      |
| <b>Intersection Summary</b>  |       |      |      |      |       |      |      |      |      |      |      |      |
| HCM 2010 Ctrl Delay          | 38.8  |      |      |      |       |      |      |      |      |      |      |      |
| HCM 2010 LOS                 | D     |      |      |      |       |      |      |      |      |      |      |      |
| <b>Notes</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |

HCM Signalized Intersection Capacity Analysis  
1: Sonoma Hwy (SR 12) & Middle Rincon Road

01/04/2021

| Movement                          | EBL   | EBT  | EBR                       | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |  |
|-----------------------------------|-------|------|---------------------------|------|-------|------|------|------|------|------|------|------|--|
| Lane Configurations               | ↔     | ↕    | ↔                         | ↔    | ↕     | ↔    |      |      |      | ↔    | ↕    | ↔    |  |
| Traffic Volume (vph)              | 150   | 1119 | 3                         | 8    | 1249  | 178  | 0    | 0    | 0    | 157  | 4    | 197  |  |
| Future Volume (vph)               | 150   | 1119 | 3                         | 8    | 1249  | 178  | 0    | 0    | 0    | 157  | 4    | 197  |  |
| Ideal Flow (vphpl)                | 1900  | 1900 | 1900                      | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |  |
| Total Lost time (s)               | 4.7   | 5.8  |                           | 4.7  | 5.8   |      |      |      |      |      |      | 5.1  |  |
| Lane Util. Factor                 | 1.00  | 0.95 |                           | 1.00 | 0.95  |      |      |      |      |      |      | 0.95 |  |
| Fr't                              | 1.00  | 1.00 |                           | 1.00 | 0.98  |      |      |      |      |      |      | 0.92 |  |
| Flt Protected                     | 0.95  | 1.00 |                           | 0.95 | 1.00  |      |      |      |      |      |      | 0.98 |  |
| Sat'd. Flow (prot)                | 1770  | 3538 |                           | 1770 | 3473  |      |      |      |      |      |      | 3177 |  |
| Flt Permitted                     | 0.95  | 1.00 |                           | 0.95 | 1.00  |      |      |      |      |      |      | 0.98 |  |
| Sat'd. Flow (perm)                | 1770  | 3538 |                           | 1770 | 3473  |      |      |      |      |      |      | 3177 |  |
| 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)                   | 158   | 1178 | 3                         | 8    | 1315  | 187  | 0    | 0    | 0    | 165  | 4    | 207  |  |
| RTOR Reduction (vph)              | 0     | 0    | 0                         | 0    | 6     | 0    | 0    | 0    | 0    | 0    | 0    | 169  |  |
| Lane Group Flow (vph)             | 158   | 1181 | 0                         | 8    | 1496  | 0    | 0    | 0    | 0    | 0    | 0    | 207  |  |
| Turn Type                         | Prot  | NA   |                           | Prot | NA    |      |      |      |      | Perm | NA   |      |  |
| Protected Phases                  | 5     | 2    |                           | 1    | 6     |      |      |      |      |      | 4    |      |  |
| Permitted Phases                  |       |      |                           |      |       |      |      |      |      | 4    |      |      |  |
| Actuated Green, G (s)             | 17.3  | 74.9 |                           | 3.1  | 60.7  |      |      |      |      |      |      | 13.0 |  |
| Effective Green, g (s)            | 17.3  | 74.9 |                           | 3.1  | 60.7  |      |      |      |      |      |      | 13.0 |  |
| Actuated g/C Ratio                | 0.16  | 0.70 |                           | 0.03 | 0.57  |      |      |      |      |      |      | 0.12 |  |
| Clearance Time (s)                | 4.7   | 5.8  |                           | 4.7  | 5.8   |      |      |      |      |      |      | 5.1  |  |
| Vehicle Extension (s)             | 2.0   | 4.5  |                           | 2.0  | 4.5   |      |      |      |      |      |      | 2.0  |  |
| Lane Grp Cap (vph)                | 287   | 2485 |                           | 51   | 1977  |      |      |      |      |      |      | 387  |  |
| v/s Ratio Prot                    | c0.09 | 0.33 |                           | 0.00 | c0.43 |      |      |      |      |      |      | 0.07 |  |
| v/s Ratio Perm                    |       |      |                           |      |       |      |      |      |      |      |      | 0.07 |  |
| v/c Ratio                         | 0.55  | 0.48 |                           | 0.16 | 0.76  |      |      |      |      |      |      | 0.54 |  |
| Uniform Delay, d1                 | 41.1  | 7.1  |                           | 50.5 | 17.4  |      |      |      |      |      |      | 44.0 |  |
| Progression Factor                | 1.00  | 1.00 |                           | 1.00 | 1.00  |      |      |      |      |      |      | 1.00 |  |
| Incremental Delay, d2             | 1.3   | 0.2  |                           | 0.5  | 1.9   |      |      |      |      |      |      | 0.7  |  |
| Delay (s)                         | 42.4  | 7.3  |                           | 51.0 | 19.3  |      |      |      |      |      |      | 44.7 |  |
| Level of Service                  | D     | A    |                           | D    | B     |      |      |      |      |      |      | D    |  |
| Approach Delay (s)                |       | 11.5 |                           |      | 19.5  |      |      | 0.0  |      |      |      | 44.7 |  |
| Approach LOS                      |       | B    |                           |      | B     |      |      | A    |      |      |      | D    |  |
| <b>Intersection Summary</b>       |       |      |                           |      |       |      |      |      |      |      |      |      |  |
| HCM 2000 Control Delay            | 19.1  |      | HCM 2000 Level of Service |      |       |      |      | B    |      |      |      |      |  |
| HCM 2000 Volume to Capacity ratio | 0.72  |      |                           |      |       |      |      |      |      |      |      |      |  |
| Actuated Cycle Length (s)         | 106.6 |      | Sum of lost time (s)      |      |       |      |      | 20.3 |      |      |      |      |  |
| Intersection Capacity Utilization | 72.5% |      | ICU Level of Service      |      |       |      |      | C    |      |      |      |      |  |
| Analysis Period (min)             | 15    |      |                           |      |       |      |      |      |      |      |      |      |  |
| c Critical Lane Group             |       |      |                           |      |       |      |      |      |      |      |      |      |  |

HCM 2010 Signalized Intersection Summary  
2: Calistoga Road & Sonoma Hwy (SR 12)

01/04/2021

| Movement                     | EBL   | EBT  | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |  |
|------------------------------|-------|------|------|------|-------|------|------|------|------|------|------|------|--|
| Lane Configurations          | ↔     | ↕    | ↔    | ↔    | ↕     | ↔    |      |      |      | ↔    | ↕    | ↔    |  |
| Traffic Volume (veh/h)       | 474   | 764  | 21   | 15   | 1025  | 228  | 25   | 4    | 5    | 249  | 0    | 414  |  |
| Future Volume (veh/h)        | 474   | 764  | 21   | 15   | 1025  | 228  | 25   | 4    | 5    | 249  | 0    | 414  |  |
| Number                       | 5     | 2    | 12   | 1    | 6     | 16   | 3    | 8    | 18   | 7    | 4    | 14   |  |
| Initial Q (Qb), veh          | 0     | 0    | 0    | 0    | 0     | 0    | 0    | 0    | 0    | 0    | 0    | 0    |  |
| Ped-Bike Adj(A_pbT)          | 1.00  |      | 0.98 | 1.00 |       | 0.99 | 1.00 |      | 1.00 | 1.00 |      | 1.00 |  |
| Parking Bus, Adj             | 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 Sat Flow, veh/h/ln       | 1845  | 1810 | 1863 | 1863 | 1816  | 1900 | 1900 | 1863 | 1900 | 1900 | 1845 | 1845 |  |
| Adj Flow Rate, veh/h         | 489   | 788  | 14   | 15   | 1057  | 136  | 26   | 4    | 3    | 257  | 0    | 263  |  |
| Adj No. of Lanes             | 2     | 2    | 1    | 1    | 2     | 0    | 0    | 1    | 0    | 0    | 0    | 1    |  |
| 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 |  |
| Percent Heavy Veh, %         | 3     | 5    | 2    | 2    | 5     | 5    | 2    | 2    | 2    | 2    | 2    | 3    |  |
| Cap, veh/h                   | 556   | 1840 | 829  | 54   | 1236  | 159  | 103  | 16   | 12   | 294  | 0    | 518  |  |
| Arrive On Green              | 0.16  | 0.54 | 0.54 | 0.03 | 0.40  | 0.40 | 0.07 | 0.07 | 0.07 | 0.17 | 0.00 | 0.17 |  |
| Sat Flow, veh/h              | 3408  | 3438 | 1548 | 1774 | 3070  | 395  | 1390 | 214  | 160  | 1757 | 0    | 1568 |  |
| Grp Volume(v), veh/h         | 489   | 788  | 14   | 15   | 593   | 600  | 33   | 0    | 0    | 257  | 0    | 263  |  |
| Grp Sat Flow(s),veh/h/ln     | 1704  | 1719 | 1548 | 1774 | 1725  | 1740 | 1764 | 0    | 0    | 1757 | 0    | 1568 |  |
| Q Serve(g_s), s              | 15.0  | 14.8 | 0.5  | 0.9  | 33.6  | 33.7 | 1.9  | 0.0  | 0.0  | 15.3 | 0.0  | 14.5 |  |
| Cycle Q Clear(g_c), s        | 15.0  | 14.8 | 0.5  | 0.9  | 33.6  | 33.7 | 1.9  | 0.0  | 0.0  | 15.3 | 0.0  | 14.5 |  |
| Prop In Lane                 | 1.00  |      | 1.00 | 1.00 |       | 0.23 | 0.79 |      | 0.09 | 1.00 |      | 1.00 |  |
| Lane Grp Cap(c), veh/h       | 556   | 1840 | 829  | 54   | 694   | 700  | 130  | 0    | 0    | 294  | 0    | 518  |  |
| V/C Ratio(X)                 | 0.88  | 0.43 | 0.02 | 0.28 | 0.85  | 0.86 | 0.25 | 0.00 | 0.00 | 0.87 | 0.00 | 0.51 |  |
| Avail Cap(c_a), veh/h        | 613   | 1872 | 843  | 149  | 774   | 780  | 591  | 0    | 0    | 326  | 0    | 547  |  |
| HCM Platoon Ratio            | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| Upstream Filter(I)           | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |  |
| Uniform Delay (d), s/veh     | 43.8  | 15.0 | 11.7 | 50.9 | 29.2  | 29.2 | 46.9 | 0.0  | 0.0  | 43.5 | 0.0  | 28.9 |  |
| Incr Delay (d2), s/veh       | 13.0  | 0.2  | 0.0  | 2.8  | 9.1   | 9.1  | 1.0  | 0.0  | 0.0  | 20.7 | 0.0  | 0.8  |  |
| Initial Q Delay(d3),s/veh    | 0.0   | 0.0  | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |  |
| %ile BackOfQ(50%),veh/ln     | 8.1   | 7.1  | 0.2  | 0.5  | 17.7  | 17.9 | 1.0  | 0.0  | 0.0  | 9.1  | 0.0  | 6.4  |  |
| LnGrp Delay(d),s/veh         | 56.9  | 15.2 | 11.7 | 53.6 | 38.2  | 38.3 | 47.9 | 0.0  | 0.0  | 64.2 | 0.0  | 29.6 |  |
| LnGrp LOS                    | E     | B    | B    | D    | D     | D    | D    | D    | D    | E    |      | C    |  |
| Approach Vol, veh/h          | 1291  |      |      | 1208 |       |      |      | 33   |      |      | 520  |      |  |
| Approach Delay, s/veh        | 31.0  |      |      | 38.5 |       |      |      | 47.9 |      |      | 46.7 |      |  |
| Approach LOS                 | C     |      |      | D    |       |      |      | D    |      |      | D    |      |  |
| <b>Timer</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |  |
| Assigned Phs                 | 1     | 2    | 3    | 4    | 5     | 6    | 7    | 8    |      |      |      |      |  |
| Phs Duration (G+Y+Rc), s     | 7.9   | 63.2 |      | 23.1 | 22.2  | 49.0 | 13.0 |      |      |      |      |      |  |
| Change Period (Y+Rc), s      | * 4.7 | 5.8  |      | 5.1  | * 4.7 | 5.8  | 5.1  |      |      |      |      |      |  |
| Max Green Setting (Gmax), s  | * 9   | 58.4 |      | 19.9 | * 19  | 48.1 | 35.9 |      |      |      |      |      |  |
| Max Q Clear Time (g_c+1t), s | 2.9   | 16.8 |      | 17.3 | 17.0  | 35.7 | 3.9  |      |      |      |      |      |  |
| Green Ext Time (p_c), s      | 0.0   | 8.7  |      | 0.7  | 0.5   | 7.5  | 0.1  |      |      |      |      |      |  |
| <b>Intersection Summary</b>  |       |      |      |      |       |      |      |      |      |      |      |      |  |
| HCM 2010 Ctrl Delay          | 36.8  |      |      |      |       |      |      |      |      |      |      |      |  |
| HCM 2010 LOS                 | D     |      |      |      |       |      |      |      |      |      |      |      |  |
| <b>Notes</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |  |

HCM Signalized Intersection Capacity Analysis  
 1: Sonoma Hwy (SR 12) & Middle Rincon Road

01/04/2021

| Movement               | EBL   | EBT  | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------|-------|------|------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations    | ↔     | ↕    | ↔    | ↔    | ↕     | ↔    | ↔    | ↕    | ↔    | ↔    | ↕    | ↔    |
| Traffic Volume (vph)   | 263   | 1240 | 20   | 10   | 1309  | 152  | 0    | 0    | 1    | 172  | 5    | 179  |
| Future Volume (vph)    | 263   | 1240 | 20   | 10   | 1309  | 152  | 0    | 0    | 1    | 172  | 5    | 179  |
| Ideal Flow (vphpl)     | 1900  | 1900 | 1900 | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)    | 4.7   | 5.8  |      | 4.7  | 5.8   |      |      | 4.0  |      |      | 5.1  |      |
| Lane Util. Factor      | 1.00  | 0.95 |      | 1.00 | 0.95  |      |      | 1.00 |      |      | 0.95 |      |
| Frt                    | 1.00  | 1.00 |      | 1.00 | 0.98  |      |      | 0.85 |      |      | 0.92 |      |
| Flt Protected          | 0.95  | 1.00 |      | 0.95 | 1.00  |      |      | 1.00 |      |      | 0.98 |      |
| Satd. Flow (prot)      | 1770  | 3531 |      | 1770 | 3484  |      |      | 0    |      |      | 3195 |      |
| Flt Permitted          | 0.95  | 1.00 |      | 0.95 | 1.00  |      |      | 1.00 |      |      | 0.98 |      |
| Satd. Flow (perm)      | 1770  | 3531 |      | 1770 | 3484  |      |      | 0    |      |      | 3195 |      |
| Peak-hour factor, PHF  | 0.93  | 0.93 | 0.93 | 0.93 | 0.93  | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)        | 283   | 1333 | 22   | 11   | 1408  | 163  | 0    | 0    | 1    | 185  | 5    | 192  |
| RTOR Reduction (vph)   | 0     | 0    | 0    | 0    | 5     | 0    | 0    | 1    | 0    | 0    | 134  | 0    |
| Lane Group Flow (vph)  | 283   | 1355 | 0    | 11   | 1566  | 0    | 0    | 0    | 0    | 0    | 248  | 0    |
| Turn Type              | Prot  | NA   |      | Prot | NA    |      |      |      |      | Perm | NA   |      |
| Protected Phases       | 5     | 2    |      | 1    | 6     |      |      |      |      |      | 4    |      |
| Permitted Phases       | 4     |      |      |      |       |      |      |      |      |      |      |      |
| Actuated Green, G (s)  | 23.0  | 79.9 |      | 3.4  | 60.3  |      |      | 0.0  |      |      | 15.3 |      |
| Effective Green, g (s) | 23.0  | 79.9 |      | 3.4  | 60.3  |      |      | 0.0  |      |      | 15.3 |      |
| Actuated g/C Ratio     | 0.20  | 0.70 |      | 0.03 | 0.53  |      |      | 0.00 |      |      | 0.13 |      |
| Clearance Time (s)     | 4.7   | 5.8  |      | 4.7  | 5.8   |      |      |      |      |      | 5.1  |      |
| Vehicle Extension (s)  | 3.0   | 3.0  |      | 3.0  | 3.0   |      |      |      |      |      | 3.0  |      |
| Lane Grp Cap (vph)     | 356   | 2470 |      | 52   | 1839  |      |      | 0    |      |      | 428  |      |
| v/s Ratio Prot         | c0.16 | 0.38 |      | 0.01 | c0.45 |      |      |      |      |      | 0.08 |      |
| v/s Ratio Perm         | 0.08  |      |      |      |       |      |      |      |      |      |      |      |
| v/c Ratio              | 0.79  | 0.55 |      | 0.21 | 0.85  |      |      | 0.00 |      |      | 0.58 |      |
| Uniform Delay, d1      | 43.4  | 8.4  |      | 54.1 | 23.1  |      |      | 57.1 |      |      | 46.4 |      |
| Progression Factor     | 1.00  | 1.00 |      | 1.00 | 1.00  |      |      | 1.00 |      |      | 1.00 |      |
| Incremental Delay, d2  | 11.6  | 0.3  |      | 2.0  | 4.0   |      |      | 0.0  |      |      | 1.9  |      |
| Delay (s)              | 55.0  | 8.6  |      | 56.1 | 27.1  |      |      | 57.1 |      |      | 48.3 |      |
| Level of Service       | D     | A    |      | E    | C     |      |      | E    |      |      | D    |      |
| Approach Delay (s)     | 16.6  |      |      | 27.3 |       |      |      | 57.1 |      |      | 48.3 |      |
| Approach LOS           | B     |      |      | C    |       |      |      | E    |      |      | D    |      |

| Intersection Summary              |       |                           |
|-----------------------------------|-------|---------------------------|
| HCM 2000 Control Delay            | 24.7  | HCM 2000 Level of Service |
| HCM 2000 Volume to Capacity ratio | 0.84  | C                         |
| Actuated Cycle Length (s)         | 114.2 | Sum of lost time (s)      |
| Intersection Capacity Utilization | Err%  | ICU Level of Service      |
| Analysis Period (min)             | 15    | H                         |

c Critical Lane Group

HCM 2010 Signalized Intersection Summary  
 2: Calistoga Road & Sonoma Hwy (SR 12)

01/04/2021

| Movement                  | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations       | ↔    | ↕    | ↔    | ↔    | ↕    | ↔    | ↔    | ↕    | ↔    | ↔    | ↕    | ↔    |
| Traffic Volume (veh/h)    | 456  | 866  | 18   | 53   | 949  | 269  | 14   | 6    | 5    | 317  | 8    | 386  |
| Future Volume (veh/h)     | 456  | 866  | 18   | 53   | 949  | 269  | 14   | 6    | 5    | 317  | 8    | 386  |
| Number                    | 5    | 2    | 12   | 1    | 6    | 16   | 3    | 8    | 18   | 7    | 4    | 14   |
| Initial Q (Qb), veh       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Ped-Bike Adj(A_pbT)       | 1.00 |      | 0.98 | 1.00 |      | 0.99 | 1.00 |      | 0.99 | 1.00 |      | 1.00 |
| Parking Bus, Adj          | 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 Sat Flow, veh/h/ln    | 1845 | 1810 | 1863 | 1863 | 1817 | 1900 | 1900 | 1863 | 1900 | 1900 | 1845 | 1845 |
| Adj Flow Rate, veh/h      | 470  | 893  | 16   | 55   | 978  | 152  | 14   | 6    | 3    | 327  | 8    | 273  |
| Adj No. of Lanes          | 2    | 2    | 1    | 1    | 2    | 0    | 0    | 1    | 0    | 0    | 1    | 1    |
| 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 |
| Percent Heavy Veh, %      | 3    | 5    | 2    | 2    | 5    | 5    | 2    | 2    | 2    | 2    | 2    | 3    |
| Cap, veh/h                | 566  | 1428 | 643  | 130  | 963  | 150  | 75   | 32   | 16   | 379  | 9    | 607  |
| Arrive On Green           | 0.17 | 0.42 | 0.42 | 0.07 | 0.32 | 0.32 | 0.07 | 0.07 | 0.07 | 0.22 | 0.22 | 0.22 |
| Sat Flow, veh/h           | 3408 | 3438 | 1547 | 1774 | 2989 | 464  | 1075 | 461  | 230  | 1717 | 42   | 1568 |
| Grp Volume(v), veh/h      | 470  | 893  | 16   | 55   | 564  | 566  | 23   | 0    | 0    | 335  | 0    | 273  |
| Grp Sat Flow(s),veh/h/ln  | 1704 | 1719 | 1547 | 1774 | 1726 | 1727 | 1766 | 0    | 0    | 1759 | 0    | 1568 |
| Q Serve(g_s), s           | 12.5 | 19.2 | 0.6  | 2.8  | 30.2 | 30.2 | 1.2  | 0.0  | 0.0  | 17.2 | 0.0  | 12.1 |
| Cycle Q Clear(g_c), s     | 12.5 | 19.2 | 0.6  | 2.8  | 30.2 | 30.2 | 1.2  | 0.0  | 0.0  | 17.2 | 0.0  | 12.1 |
| Prop In Lane              | 1.00 |      | 1.00 | 1.00 |      | 0.27 | 0.61 |      | 0.13 | 0.98 |      | 1.00 |
| Lane Grp Cap(c), veh/h    | 566  | 1428 | 643  | 130  | 556  | 556  | 124  | 0    | 0    | 389  | 0    | 607  |
| V/C Ratio(X)              | 0.83 | 0.63 | 0.02 | 0.42 | 1.02 | 1.02 | 0.19 | 0.00 | 0.00 | 0.86 | 0.00 | 0.45 |
| Avail Cap(c_a), veh/h     | 811  | 1548 | 697  | 195  | 556  | 556  | 676  | 0    | 0    | 467  | 0    | 677  |
| HCM Platoon Ratio         | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I)        | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh  | 37.8 | 21.7 | 16.2 | 41.6 | 31.8 | 31.8 | 41.1 | 0.0  | 0.0  | 35.1 | 0.0  | 21.3 |
| Incr Delay (d2), s/veh    | 5.0  | 0.9  | 0.0  | 2.2  | 42.0 | 42.3 | 0.7  | 0.0  | 0.0  | 13.3 | 0.0  | 0.5  |
| Initial Q Delay(d3),s/veh | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| %ile BackOfQ(50%),veh/ln  | 6.3  | 9.2  | 0.2  | 1.4  | 20.7 | 20.8 | 0.6  | 0.0  | 0.0  | 9.8  | 0.0  | 5.3  |
| LnGrp Delay(d),s/veh      | 42.8 | 22.5 | 16.2 | 43.8 | 73.8 | 74.1 | 41.8 | 0.0  | 0.0  | 48.4 | 0.0  | 21.8 |
| LnGrp LOS                 | D    | C    | B    | D    | F    | F    | D    |      |      | D    |      | C    |
| Approach Vol, veh/h       | 1379 |      |      | 1185 |      |      | 23   |      |      | 608  |      |      |
| Approach Delay, s/veh     | 29.4 |      |      | 72.5 |      |      | 41.8 |      |      | 36.5 |      |      |
| Approach LOS              | C    |      |      | E    |      |      | D    |      |      | D    |      |      |

| Timer                        | 1     | 2    | 3 | 4    | 5     | 6    | 7 | 8    |
|------------------------------|-------|------|---|------|-------|------|---|------|
| Assigned Phs                 | 1     | 2    |   | 4    | 5     | 6    |   | 8    |
| Phs Duration (G+Y+Rc), s     | 11.6  | 44.7 |   | 25.8 | 20.3  | 36.0 |   | 11.7 |
| Change Period (Y+Rc), s      | * 4.7 | 5.8  |   | 5.1  | * 4.7 | 5.8  |   | 5.1  |
| Max Green Setting (Gmax), s  | * 10  | 42.2 |   | 24.9 | * 22  | 30.2 |   | 35.9 |
| Max Q Clear Time (g_c+1t), s | 4.8   | 21.2 |   | 19.2 | 14.5  | 32.2 |   | 3.2  |
| Green Ext Time (p_c), s      | 0.0   | 8.1  |   | 1.5  | 1.1   | 0.0  |   | 0.1  |

| Intersection Summary |      |
|----------------------|------|
| HCM 2010 Ctrl Delay  | 46.8 |
| HCM 2010 LOS         | D    |

Notes

HCM Signalized Intersection Capacity Analysis  
1: Sonoma Hwy (SR 12) & Middle Rincon Road

01/04/2021

| Movement                          | EBL   | EBT  | EBR                       | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-----------------------------------|-------|------|---------------------------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations               | ↔     | ↕    | ↔                         | ↔    | ↕     | ↔    |      |      |      |      | ↕    | ↕    |
| Traffic Volume (vph)              | 163   | 1045 | 3                         | 8    | 1165  | 191  | 0    | 0    | 0    | 170  | 4    | 197  |
| Future Volume (vph)               | 163   | 1045 | 3                         | 8    | 1165  | 191  | 0    | 0    | 0    | 170  | 4    | 197  |
| Ideal Flow (vphpl)                | 1900  | 1900 | 1900                      | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)               | 4.7   | 5.8  |                           | 4.7  | 5.8   |      |      |      |      |      |      | 5.1  |
| Lane Util. Factor                 | 1.00  | 0.95 |                           | 1.00 | 0.95  |      |      |      |      |      |      | 0.95 |
| Frt                               | 1.00  | 1.00 |                           | 1.00 | 0.98  |      |      |      |      |      |      | 0.92 |
| Flt Protected                     | 0.95  | 1.00 |                           | 0.95 | 1.00  |      |      |      |      |      |      | 0.98 |
| Satd. Flow (prot)                 | 1770  | 3538 |                           | 1770 | 3464  |      |      |      |      |      |      | 3184 |
| Flt Permitted                     | 0.95  | 1.00 |                           | 0.95 | 1.00  |      |      |      |      |      |      | 0.98 |
| Satd. Flow (perm)                 | 1770  | 3538 |                           | 1770 | 3464  |      |      |      |      |      |      | 3184 |
| 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)                   | 172   | 1100 | 3                         | 8    | 1226  | 201  | 0    | 0    | 0    | 179  | 4    | 207  |
| RTOR Reduction (vph)              | 0     | 0    | 0                         | 0    | 7     | 0    | 0    | 0    | 0    | 0    | 152  | 0    |
| Lane Group Flow (vph)             | 172   | 1103 | 0                         | 8    | 1420  | 0    | 0    | 0    | 0    | 0    | 238  | 0    |
| Turn Type                         | Prot  | NA   |                           | Prot | NA    |      |      |      |      | Perm | NA   |      |
| Protected Phases                  | 5     | 2    |                           | 1    | 6     |      |      |      |      |      | 4    |      |
| Permitted Phases                  | 4     |      |                           |      |       |      |      |      |      |      |      |      |
| Actuated Green, G (s)             | 18.6  | 70.4 |                           | 3.4  | 55.2  |      |      |      |      |      |      | 13.8 |
| Effective Green, g (s)            | 18.6  | 70.4 |                           | 3.4  | 55.2  |      |      |      |      |      |      | 13.8 |
| Actuated g/C Ratio                | 0.18  | 0.68 |                           | 0.03 | 0.53  |      |      |      |      |      |      | 0.13 |
| Clearance Time (s)                | 4.7   | 5.8  |                           | 4.7  | 5.8   |      |      |      |      |      |      | 5.1  |
| Vehicle Extension (s)             | 2.0   | 4.5  |                           | 2.0  | 4.5   |      |      |      |      |      |      | 2.0  |
| Lane Grp Cap (vph)                | 319   | 2413 |                           | 58   | 1852  |      |      |      |      |      |      | 425  |
| v/s Ratio Prot                    | c0.10 | 0.31 |                           | 0.00 | c0.41 |      |      |      |      |      |      | 0.07 |
| v/s Ratio Perm                    | 0.07  |      |                           |      |       |      |      |      |      |      |      |      |
| v/c Ratio                         | 0.54  | 0.46 |                           | 0.14 | 0.77  |      |      |      |      |      |      | 0.56 |
| Uniform Delay, d1                 | 38.4  | 7.6  |                           | 48.5 | 18.9  |      |      |      |      |      |      | 41.9 |
| Progression Factor                | 1.00  | 1.00 |                           | 1.00 | 1.00  |      |      |      |      |      |      | 1.00 |
| Incremental Delay, d2             | 0.9   | 0.2  |                           | 0.4  | 2.2   |      |      |      |      |      |      | 0.9  |
| Delay (s)                         | 39.3  | 7.8  |                           | 48.9 | 21.1  |      |      |      |      |      |      | 42.8 |
| Level of Service                  | D     | A    |                           | D    | C     |      |      |      |      |      |      | D    |
| Approach Delay (s)                | 12.1  |      |                           |      | 21.3  |      | 0.0  |      |      |      | 42.8 |      |
| Approach LOS                      | B     |      |                           |      | C     |      | A    |      |      |      | D    |      |
| <b>Intersection Summary</b>       |       |      |                           |      |       |      |      |      |      |      |      |      |
| HCM 2000 Control Delay            | 20.2  |      | HCM 2000 Level of Service |      | C     |      |      |      |      |      |      |      |
| HCM 2000 Volume to Capacity ratio | 0.72  |      |                           |      |       |      |      |      |      |      |      |      |
| Actuated Cycle Length (s)         | 103.2 |      | Sum of lost time (s)      |      | 20.3  |      |      |      |      |      |      |      |
| Intersection Capacity Utilization | 71.7% |      | ICU Level of Service      |      | C     |      |      |      |      |      |      |      |
| Analysis Period (min)             | 15    |      |                           |      |       |      |      |      |      |      |      |      |
| c Critical Lane Group             |       |      |                           |      |       |      |      |      |      |      |      |      |

HCM 2010 Signalized Intersection Summary  
2: Calistoga Road & Sonoma Hwy (SR 12)

01/04/2021

| Movement                     | EBL   | EBT  | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------------|-------|------|------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations          | ↔     | ↕    | ↔    | ↔    | ↕     | ↔    |      |      |      |      | ↕    | ↕    |
| Traffic Volume (veh/h)       | 471   | 703  | 21   | 15   | 976   | 222  | 25   | 4    | 5    | 241  | 0    | 414  |
| Future Volume (veh/h)        | 471   | 703  | 21   | 15   | 976   | 222  | 25   | 4    | 5    | 241  | 0    | 414  |
| Number                       | 5     | 2    | 12   | 1    | 6     | 16   | 3    | 8    | 18   | 7    | 4    | 14   |
| Initial Q (Qb), veh          | 0     | 0    | 0    | 0    | 0     | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Ped-Bike Adj(A_pbT)          | 1.00  |      | 0.98 | 1.00 |       | 0.99 | 1.00 |      | 1.00 | 1.00 |      | 1.00 |
| Parking Bus, Adj             | 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 Sat Flow, veh/h/ln       | 1845  | 1810 | 1863 | 1863 | 1816  | 1900 | 1900 | 1863 | 1900 | 1900 | 1845 | 1845 |
| Adj Flow Rate, veh/h         | 486   | 725  | 14   | 15   | 1006  | 130  | 26   | 4    | 3    | 248  | 0    | 263  |
| Adj No. of Lanes             | 2     | 2    | 1    | 1    | 2     | 0    | 0    | 1    | 0    | 0    | 1    | 1    |
| 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 |
| Percent Heavy Veh, %         | 3     | 5    | 2    | 2    | 5     | 5    | 2    | 2    | 2    | 2    | 2    | 3    |
| Cap, veh/h                   | 558   | 1818 | 819  | 54   | 1213  | 157  | 104  | 16   | 12   | 290  | 0    | 516  |
| Arrive On Green              | 0.16  | 0.53 | 0.53 | 0.03 | 0.40  | 0.40 | 0.08 | 0.08 | 0.08 | 0.17 | 0.00 | 0.17 |
| Sat Flow, veh/h              | 3408  | 3438 | 1548 | 1774 | 3069  | 396  | 1390 | 214  | 160  | 1757 | 0    | 1568 |
| Grp Volume(v), veh/h         | 486   | 725  | 14   | 15   | 565   | 571  | 33   | 0    | 0    | 248  | 0    | 263  |
| Grp Sat Flow(s),veh/h/ln     | 1704  | 1719 | 1548 | 1774 | 1725  | 1740 | 1764 | 0    | 0    | 1757 | 0    | 1568 |
| Q Serve(g_s), s              | 14.3  | 13.0 | 0.4  | 0.9  | 30.4  | 30.5 | 1.8  | 0.0  | 0.0  | 14.2 | 0.0  | 14.0 |
| Cycle Q Clear(g_c), s        | 14.3  | 13.0 | 0.4  | 0.9  | 30.4  | 30.5 | 1.8  | 0.0  | 0.0  | 14.2 | 0.0  | 14.0 |
| Prop In Lane                 | 1.00  |      | 1.00 | 1.00 |       | 0.23 | 0.79 |      | 0.09 | 1.00 |      | 1.00 |
| Lane Grp Cap(c), veh/h       | 558   | 1818 | 819  | 54   | 682   | 688  | 132  | 0    | 0    | 290  | 0    | 516  |
| V/C Ratio(X)                 | 0.87  | 0.40 | 0.02 | 0.28 | 0.83  | 0.83 | 0.25 | 0.00 | 0.00 | 0.85 | 0.00 | 0.51 |
| Avail Cap(c_a), veh/h        | 638   | 1946 | 876  | 155  | 804   | 811  | 614  | 0    | 0    | 339  | 0    | 559  |
| HCM Platoon Ratio            | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I)           | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh     | 42.1  | 14.5 | 11.6 | 48.9 | 28.1  | 28.1 | 45.0 | 0.0  | 0.0  | 41.9 | 0.0  | 27.9 |
| Incr Delay (d2), s/veh       | 11.4  | 0.2  | 0.0  | 2.7  | 6.9   | 6.9  | 1.0  | 0.0  | 0.0  | 16.8 | 0.0  | 0.8  |
| Initial Q Delay(d3),s/veh    | 0.0   | 0.0  | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| %ile BackOfQ(50%),veh/ln     | 7.6   | 6.2  | 0.2  | 0.5  | 15.8  | 15.9 | 0.9  | 0.0  | 0.0  | 8.2  | 0.0  | 6.1  |
| LnGrp Delay(d),s/veh         | 53.4  | 14.7 | 11.6 | 51.6 | 35.0  | 35.0 | 46.0 | 0.0  | 0.0  | 58.7 | 0.0  | 28.7 |
| LnGrp LOS                    | D     | B    | B    | D    | C     | C    | D    |      |      | E    |      | C    |
| Approach Vol, veh/h          | 1225  |      |      |      | 1151  |      | 33   |      |      |      | 511  |      |
| Approach Delay, s/veh        | 30.0  |      |      |      | 35.2  |      | 46.0 |      |      |      | 43.3 |      |
| Approach LOS                 | C     |      |      |      | D     |      | D    |      |      |      | D    |      |
| <b>Timer</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |
| Assigned Phs                 | 1     | 2    | 3    | 4    | 5     | 6    | 7    | 8    |      |      |      |      |
| Phs Duration (G+Y+Rc), s     | 7.8   | 60.4 |      | 22.1 | 21.6  | 46.6 | 12.8 |      |      |      |      |      |
| Change Period (Y+Rc), s      | * 4.7 | 5.8  |      | 5.1  | * 4.7 | 5.8  | 5.1  |      |      |      |      |      |
| Max Green Setting (Gmax), s  | * 9   | 58.4 |      | 19.9 | * 19  | 48.1 | 35.9 |      |      |      |      |      |
| Max Q Clear Time (g_c+1t), s | 2.9   | 15.0 |      | 16.2 | 16.3  | 32.5 | 3.8  |      |      |      |      |      |
| Green Ext Time (p_c), s      | 0.0   | 7.8  |      | 0.9  | 0.6   | 8.3  | 0.1  |      |      |      |      |      |
| <b>Intersection Summary</b>  |       |      |      |      |       |      |      |      |      |      |      |      |
| HCM 2010 Ctrl Delay          |       |      | 34.6 |      |       |      |      |      |      |      |      |      |
| HCM 2010 LOS                 |       |      | C    |      |       |      |      |      |      |      |      |      |
| <b>Notes</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |

HCM Signalized Intersection Capacity Analysis  
1: Sonoma Hwy (SR 12) & Middle Rincon Road

01/04/2021

| Movement                          | EBL   | EBT  | EBR  | WBL                       | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-----------------------------------|-------|------|------|---------------------------|-------|------|------|------|------|------|------|------|
| Lane Configurations               | ↔     | ↕    | ↔    | ↔                         | ↕     | ↔    |      |      |      | ↔    | ↕    | ↔    |
| Traffic Volume (vph)              | 272   | 1168 | 20   | 10                        | 1229  | 161  | 0    | 0    | 1    | 181  | 5    | 179  |
| Future Volume (vph)               | 272   | 1168 | 20   | 10                        | 1229  | 161  | 0    | 0    | 1    | 181  | 5    | 179  |
| Ideal Flow (vphpl)                | 1900  | 1900 | 1900 | 1900                      | 1900  | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)               | 4.7   | 5.8  |      | 4.7                       | 5.8   |      |      | 4.0  |      |      | 5.1  |      |
| Lane Util. Factor                 | 1.00  | 0.95 |      | 1.00                      | 0.95  |      |      | 1.00 |      |      | 0.95 |      |
| Frt                               | 1.00  | 1.00 |      | 1.00                      | 0.98  |      |      | 0.85 |      |      | 0.93 |      |
| Flt Protected                     | 0.95  | 1.00 |      | 0.95                      | 1.00  |      |      | 1.00 |      |      | 0.98 |      |
| Satd. Flow (prot)                 | 1770  | 3530 |      | 1770                      | 3478  |      |      | 0    |      |      | 3200 |      |
| Flt Permitted                     | 0.95  | 1.00 |      | 0.95                      | 1.00  |      |      | 1.00 |      |      | 0.98 |      |
| Satd. Flow (perm)                 | 1770  | 3530 |      | 1770                      | 3478  |      |      | 0    |      |      | 3200 |      |
| Peak-hour factor, PHF             | 0.93  | 0.93 | 0.93 | 0.93                      | 0.93  | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)                   | 292   | 1256 | 22   | 11                        | 1322  | 173  | 0    | 0    | 1    | 195  | 5    | 192  |
| RTOR Reduction (vph)              | 0     | 0    | 0    | 0                         | 6     | 0    | 0    | 1    | 0    | 0    | 127  | 0    |
| Lane Group Flow (vph)             | 292   | 1278 | 0    | 11                        | 1489  | 0    | 0    | 0    | 0    | 0    | 265  | 0    |
| Turn Type                         | Prot  | NA   |      | Prot                      | NA    |      |      |      |      | Perm | NA   |      |
| Protected Phases                  | 5     | 2    |      | 1                         | 6     |      |      |      |      |      | 4    |      |
| Permitted Phases                  | 4     |      |      |                           |       |      |      |      |      |      |      |      |
| Actuated Green, G (s)             | 23.0  | 79.8 |      | 3.4                       | 60.2  |      |      | 0.0  |      |      | 15.9 |      |
| Effective Green, g (s)            | 23.0  | 79.8 |      | 3.4                       | 60.2  |      |      | 0.0  |      |      | 15.9 |      |
| Actuated g/C Ratio                | 0.20  | 0.70 |      | 0.03                      | 0.52  |      |      | 0.00 |      |      | 0.14 |      |
| Clearance Time (s)                | 4.7   | 5.8  |      | 4.7                       | 5.8   |      |      |      |      |      | 5.1  |      |
| Vehicle Extension (s)             | 3.0   | 3.0  |      | 3.0                       | 3.0   |      |      |      |      |      | 3.0  |      |
| Lane Grp Cap (vph)                | 354   | 2455 |      | 52                        | 1825  |      |      | 0    |      |      | 443  |      |
| v/s Ratio Prot                    | c0.17 | 0.36 |      | 0.01                      | c0.43 |      |      |      |      |      |      |      |
| v/s Ratio Perm                    | 0.08  |      |      |                           |       |      |      |      |      |      |      |      |
| v/c Ratio                         | 0.82  | 0.52 |      | 0.21                      | 0.82  |      |      | 0.00 |      |      | 0.60 |      |
| Uniform Delay, d1                 | 43.9  | 8.3  |      | 54.3                      | 22.6  |      |      | 57.4 |      |      | 46.4 |      |
| Progression Factor                | 1.00  | 1.00 |      | 1.00                      | 1.00  |      |      | 1.00 |      |      | 1.00 |      |
| Incremental Delay, d2             | 14.4  | 0.2  |      | 2.0                       | 2.9   |      |      | 0.0  |      |      | 2.2  |      |
| Delay (s)                         | 58.3  | 8.5  |      | 56.4                      | 25.6  |      |      | 57.4 |      |      | 48.6 |      |
| Level of Service                  | E     | A    |      | E                         | C     |      |      | E    |      |      | D    |      |
| Approach Delay (s)                | 17.8  |      |      | 25.8                      |       |      |      | 57.4 |      |      | 48.6 |      |
| Approach LOS                      | B     |      |      | C                         |       |      |      | E    |      |      | D    |      |
| <b>Intersection Summary</b>       |       |      |      |                           |       |      |      |      |      |      |      |      |
| HCM 2000 Control Delay            | 24.8  |      |      | HCM 2000 Level of Service |       |      |      | C    |      |      |      |      |
| HCM 2000 Volume to Capacity ratio | 0.82  |      |      |                           |       |      |      |      |      |      |      |      |
| Actuated Cycle Length (s)         | 114.7 |      |      | Sum of lost time (s)      |       |      |      | 20.3 |      |      |      |      |
| Intersection Capacity Utilization | Err%  |      |      | ICU Level of Service      |       |      |      | H    |      |      |      |      |
| Analysis Period (min)             | 15    |      |      |                           |       |      |      |      |      |      |      |      |
| c Critical Lane Group             |       |      |      |                           |       |      |      |      |      |      |      |      |

HCM 2010 Signalized Intersection Summary  
2: Calistoga Road & Sonoma Hwy (SR 12)

01/04/2021

| Movement                     | EBL   | EBT  | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------------|-------|------|------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations          | ↔     | ↕    | ↔    | ↔    | ↕     | ↔    |      |      |      | ↔    | ↕    | ↔    |
| Traffic Volume (veh/h)       | 445   | 814  | 18   | 53   | 889   | 258  | 14   | 6    | 5    | 308  | 8    | 386  |
| Future Volume (veh/h)        | 445   | 814  | 18   | 53   | 889   | 258  | 14   | 6    | 5    | 308  | 8    | 386  |
| Number                       | 5     | 2    | 12   | 1    | 6     | 16   | 3    | 8    | 18   | 7    | 4    | 14   |
| Initial Q (Qb), veh          | 0     | 0    | 0    | 0    | 0     | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Ped-Bike Adj(A_pbT)          | 1.00  |      | 0.98 | 1.00 |       | 0.99 | 1.00 |      | 0.99 | 1.00 |      | 1.00 |
| Parking Bus, Adj             | 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 Sat Flow, veh/h/ln       | 1845  | 1810 | 1863 | 1863 | 1817  | 1900 | 1900 | 1863 | 1900 | 1900 | 1845 | 1845 |
| Adj Flow Rate, veh/h         | 459   | 839  | 16   | 55   | 916   | 141  | 14   | 6    | 3    | 318  | 8    | 273  |
| Adj No. of Lanes             | 2     | 2    | 1    | 1    | 2     | 0    | 0    | 1    | 0    | 0    | 1    | 1    |
| 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 |
| Percent Heavy Veh, %         | 3     | 5    | 2    | 2    | 5     | 5    | 2    | 2    | 2    | 2    | 2    | 3    |
| Cap, veh/h                   | 557   | 1426 | 642  | 131  | 973   | 150  | 76   | 32   | 16   | 373  | 9    | 597  |
| Arrive On Green              | 0.16  | 0.41 | 0.41 | 0.07 | 0.32  | 0.32 | 0.07 | 0.07 | 0.07 | 0.22 | 0.22 | 0.22 |
| Sat Flow, veh/h              | 3408  | 3438 | 1547 | 1774 | 2994  | 461  | 1075 | 461  | 230  | 1716 | 43   | 1568 |
| Grp Volume(V), veh/h         | 459   | 839  | 16   | 55   | 528   | 529  | 23   | 0    | 0    | 326  | 0    | 273  |
| Grp Sat Flow(s),veh/h/ln     | 1704  | 1719 | 1547 | 1774 | 1726  | 1728 | 1766 | 0    | 0    | 1759 | 0    | 1568 |
| Q Serve(g_s), s              | 12.0  | 17.5 | 0.6  | 2.7  | 27.5  | 27.5 | 1.1  | 0.0  | 0.0  | 16.4 | 0.0  | 12.1 |
| Cycle Q Clear(g_c), s        | 12.0  | 17.5 | 0.6  | 2.7  | 27.5  | 27.5 | 1.1  | 0.0  | 0.0  | 16.4 | 0.0  | 12.1 |
| Prop In Lane                 | 1.00  |      | 1.00 | 1.00 |       | 0.27 | 0.61 |      | 0.13 | 0.98 |      | 1.00 |
| Lane Grp Cap(c), veh/h       | 557   | 1426 | 642  | 131  | 561   | 561  | 124  | 0    | 0    | 382  | 0    | 597  |
| V/C Ratio(X)                 | 0.82  | 0.59 | 0.02 | 0.42 | 0.94  | 0.94 | 0.19 | 0.00 | 0.00 | 0.85 | 0.00 | 0.46 |
| Avail Cap(c_a), veh/h        | 823   | 1570 | 707  | 198  | 564   | 565  | 686  | 0    | 0    | 474  | 0    | 679  |
| HCM Platoon Ratio            | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I)           | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh     | 37.4  | 20.9 | 16.0 | 40.9 | 30.3  | 30.3 | 40.5 | 0.0  | 0.0  | 34.7 | 0.0  | 21.4 |
| Incr Delay (d2), s/veh       | 4.4   | 0.6  | 0.0  | 2.1  | 24.4  | 24.5 | 0.7  | 0.0  | 0.0  | 11.8 | 0.0  | 0.5  |
| Initial Q Delay(d3),s/veh    | 0.0   | 0.0  | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| %ile BackOfQ(50%),veh/ln     | 6.0   | 8.4  | 0.2  | 1.4  | 16.9  | 16.9 | 0.6  | 0.0  | 0.0  | 9.2  | 0.0  | 5.3  |
| LnGrp Delay(d),s/veh         | 41.7  | 21.6 | 16.0 | 43.0 | 54.8  | 54.8 | 41.2 | 0.0  | 0.0  | 46.5 | 0.0  | 22.0 |
| LnGrp LOS                    | D     | C    | B    | D    | D     | D    | D    | D    | D    | D    | D    | C    |
| Approach Vol, veh/h          | 1314  |      |      | 1112 |       |      | 23   |      |      | 599  |      |      |
| Approach Delay, s/veh        | 28.5  |      |      | 54.2 |       |      | 41.2 |      |      | 35.4 |      |      |
| Approach LOS                 | C     |      |      | D    |       |      | D    |      |      | D    |      |      |
| <b>Timer</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |
| Assigned Phs                 | 1     | 2    | 3    | 4    | 5     | 6    | 7    | 8    |      |      |      |      |
| Phs Duration (G+Y+Rc), s     | 11.5  | 44.1 |      | 25.2 | 19.8  | 35.8 |      | 11.6 |      |      |      |      |
| Change Period (Y+Rc), s      | * 4.7 | 5.8  |      | 5.1  | * 4.7 | 5.8  |      | 5.1  |      |      |      |      |
| Max Green Setting (Gmax), s  | * 10  | 42.2 |      | 24.9 | * 22  | 30.2 |      | 35.9 |      |      |      |      |
| Max Q Clear Time (g_c+1t), s | 4.7   | 19.5 |      | 18.4 | 14.0  | 29.5 |      | 3.1  |      |      |      |      |
| Green Ext Time (p_c), s      | 0.0   | 7.8  |      | 1.6  | 1.1   | 0.5  |      | 0.1  |      |      |      |      |
| <b>Intersection Summary</b>  |       |      |      |      |       |      |      |      |      |      |      |      |
| HCM 2010 Ctrl Delay          | 39.3  |      |      |      |       |      |      |      |      |      |      |      |
| HCM 2010 LOS                 | D     |      |      |      |       |      |      |      |      |      |      |      |
| <b>Notes</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |



HCM Signalized Intersection Capacity Analysis  
1: Sonoma Hwy (SR 12) & Middle Rincon Road

01/04/2021

| Movement                          | EBL   | EBT  | EBR  | WBL                       | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-----------------------------------|-------|------|------|---------------------------|-------|------|------|------|------|------|------|------|
| Lane Configurations               | ↔     | ↕    | ↔    | ↔                         | ↕     | ↔    |      |      |      |      | ↕    | ↔    |
| Traffic Volume (vph)              | 163   | 1119 | 3    | 8                         | 1249  | 191  | 0    | 0    | 0    | 170  | 4    | 197  |
| Future Volume (vph)               | 163   | 1119 | 3    | 8                         | 1249  | 191  | 0    | 0    | 0    | 170  | 4    | 197  |
| Ideal Flow (vphpl)                | 1900  | 1900 | 1900 | 1900                      | 1900  | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)               | 4.7   | 5.8  |      | 4.7                       | 5.8   |      |      |      |      |      |      | 5.1  |
| Lane Util. Factor                 | 1.00  | 0.95 |      | 1.00                      | 0.95  |      |      |      |      |      |      | 0.95 |
| Frt                               | 1.00  | 1.00 |      | 1.00                      | 0.98  |      |      |      |      |      |      | 0.92 |
| Flt Protected                     | 0.95  | 1.00 |      | 0.95                      | 1.00  |      |      |      |      |      |      | 0.98 |
| Satd. Flow (prot)                 | 1770  | 3538 |      | 1770                      | 3469  |      |      |      |      |      |      | 3184 |
| Flt Permitted                     | 0.95  | 1.00 |      | 0.95                      | 1.00  |      |      |      |      |      |      | 0.98 |
| Satd. Flow (perm)                 | 1770  | 3538 |      | 1770                      | 3469  |      |      |      |      |      |      | 3184 |
| 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)                   | 172   | 1178 | 3    | 8                         | 1315  | 201  | 0    | 0    | 0    | 179  | 4    | 207  |
| RTOR Reduction (vph)              | 0     | 0    | 0    | 0                         | 7     | 0    | 0    | 0    | 0    | 0    | 153  | 0    |
| Lane Group Flow (vph)             | 172   | 1181 | 0    | 8                         | 1509  | 0    | 0    | 0    | 0    | 0    | 237  | 0    |
| Turn Type                         | Prot  | NA   |      | Prot                      | NA    |      |      |      |      | Perm | NA   |      |
| Protected Phases                  | 5     | 2    |      | 1                         | 6     |      |      |      |      |      | 4    |      |
| Permitted Phases                  | 4     |      |      |                           |       |      |      |      |      |      |      |      |
| Actuated Green, G (s)             | 18.4  | 75.8 |      | 3.2                       | 60.6  |      |      |      |      |      |      | 13.9 |
| Effective Green, g (s)            | 18.4  | 75.8 |      | 3.2                       | 60.6  |      |      |      |      |      |      | 13.9 |
| Actuated g/C Ratio                | 0.17  | 0.70 |      | 0.03                      | 0.56  |      |      |      |      |      |      | 0.13 |
| Clearance Time (s)                | 4.7   | 5.8  |      | 4.7                       | 5.8   |      |      |      |      |      |      | 5.1  |
| Vehicle Extension (s)             | 2.0   | 4.5  |      | 2.0                       | 4.5   |      |      |      |      |      |      | 2.0  |
| Lane Grp Cap (vph)                | 300   | 2471 |      | 52                        | 1937  |      |      |      |      |      |      | 407  |
| v/s Ratio Prot                    | c0.10 | 0.33 |      | 0.00                      | c0.44 |      |      |      |      |      |      | 0.07 |
| v/c Ratio                         | 0.57  | 0.48 |      | 0.15                      | 0.78  |      |      |      |      |      |      | 0.58 |
| Uniform Delay, d1                 | 41.4  | 7.4  |      | 51.3                      | 18.7  |      |      |      |      |      |      | 44.6 |
| Progression Factor                | 1.00  | 1.00 |      | 1.00                      | 1.00  |      |      |      |      |      |      | 1.00 |
| Incremental Delay, d2             | 1.6   | 0.3  |      | 0.5                       | 2.3   |      |      |      |      |      |      | 1.4  |
| Delay (s)                         | 43.1  | 7.7  |      | 51.8                      | 21.0  |      |      |      |      |      |      | 45.9 |
| Level of Service                  | D     | A    |      | D                         | C     |      |      |      |      |      |      | D    |
| Approach Delay (s)                | 12.2  |      |      |                           | 21.2  |      | 0.0  |      |      |      | 45.9 |      |
| Approach LOS                      | B     |      |      |                           | C     |      | A    |      |      |      | D    |      |
| <b>Intersection Summary</b>       |       |      |      |                           |       |      |      |      |      |      |      |      |
| HCM 2000 Control Delay            | 20.4  |      |      | HCM 2000 Level of Service |       |      | C    |      |      |      |      |      |
| HCM 2000 Volume to Capacity ratio | 0.75  |      |      |                           |       |      |      |      |      |      |      |      |
| Actuated Cycle Length (s)         | 108.5 |      |      | Sum of lost time (s)      |       |      | 20.3 |      |      |      |      |      |
| Intersection Capacity Utilization | 74.0% |      |      | ICU Level of Service      |       |      | D    |      |      |      |      |      |
| Analysis Period (min)             | 15    |      |      |                           |       |      |      |      |      |      |      |      |
| c Critical Lane Group             |       |      |      |                           |       |      |      |      |      |      |      |      |

HCM 2010 Signalized Intersection Summary  
2: Calistoga Road & Sonoma Hwy (SR 12)

01/04/2021

| Movement                     | EBL   | EBT  | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------------|-------|------|------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations          | ↔     | ↕    | ↔    | ↔    | ↕     | ↔    |      |      |      |      | ↕    | ↔    |
| Traffic Volume (veh/h)       | 474   | 777  | 21   | 15   | 1038  | 228  | 25   | 4    | 5    | 249  | 0    | 414  |
| Future Volume (veh/h)        | 474   | 777  | 21   | 15   | 1038  | 228  | 25   | 4    | 5    | 249  | 0    | 414  |
| Number                       | 5     | 2    | 12   | 1    | 6     | 16   | 3    | 8    | 18   | 7    | 4    | 14   |
| Initial Q (Qb), veh          | 0     | 0    | 0    | 0    | 0     | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Ped-Bike Adj(A_pbT)          | 1.00  |      | 0.98 | 1.00 |       | 0.99 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj             | 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 Sat Flow, veh/h/ln       | 1845  | 1810 | 1863 | 1863 | 1816  | 1900 | 1900 | 1863 | 1900 | 1900 | 1845 | 1845 |
| Adj Flow Rate, veh/h         | 489   | 801  | 14   | 15   | 1070  | 136  | 26   | 4    | 3    | 257  | 0    | 263  |
| Adj No. of Lanes             | 2     | 2    | 1    | 1    | 2     | 0    | 0    | 1    | 0    | 0    | 1    | 1    |
| 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 |
| Percent Heavy Veh, %         | 3     | 5    | 2    | 2    | 5     | 5    | 2    | 2    | 2    | 2    | 2    | 3    |
| Cap, veh/h                   | 555   | 1846 | 831  | 54   | 1243  | 158  | 102  | 16   | 12   | 294  | 0    | 518  |
| Arrive On Green              | 0.16  | 0.54 | 0.54 | 0.03 | 0.40  | 0.40 | 0.07 | 0.07 | 0.07 | 0.17 | 0.00 | 0.17 |
| Sat Flow, veh/h              | 3408  | 3438 | 1548 | 1774 | 3075  | 390  | 1390 | 214  | 160  | 1757 | 0    | 1568 |
| Grp Volume(v), veh/h         | 489   | 801  | 14   | 15   | 600   | 606  | 33   | 0    | 0    | 257  | 0    | 263  |
| Grp Sat Flow(s),veh/h/ln     | 1704  | 1719 | 1548 | 1774 | 1725  | 1741 | 1764 | 0    | 0    | 1757 | 0    | 1568 |
| Q Serve(g_s), s              | 15.1  | 15.2 | 0.5  | 0.9  | 34.2  | 34.3 | 1.9  | 0.0  | 0.0  | 15.4 | 0.0  | 14.6 |
| Cycle Q Clear(g_c), s        | 15.1  | 15.2 | 0.5  | 0.9  | 34.2  | 34.3 | 1.9  | 0.0  | 0.0  | 15.4 | 0.0  | 14.6 |
| Prop In Lane                 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 0.22 | 0.79 | 0.09 | 1.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h       | 555   | 1846 | 831  | 54   | 697   | 704  | 130  | 0    | 0    | 294  | 0    | 518  |
| V/C Ratio(X)                 | 0.88  | 0.43 | 0.02 | 0.28 | 0.86  | 0.86 | 0.25 | 0.00 | 0.00 | 0.87 | 0.00 | 0.51 |
| Avail Cap(c_a), veh/h        | 610   | 1862 | 839  | 148  | 769   | 776  | 587  | 0    | 0    | 324  | 0    | 545  |
| HCM Platoon Ratio            | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I)           | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh     | 44.1  | 15.1 | 11.7 | 51.1 | 29.3  | 29.4 | 47.1 | 0.0  | 0.0  | 43.8 | 0.0  | 29.1 |
| Incr Delay (d2), s/veh       | 13.3  | 0.2  | 0.0  | 2.8  | 9.5   | 9.6  | 1.0  | 0.0  | 0.0  | 21.0 | 0.0  | 0.8  |
| Initial Q Delay(d3),s/veh    | 0.0   | 0.0  | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| %ile BackOfQ(50%),veh/ln     | 8.2   | 7.2  | 0.2  | 0.5  | 18.2  | 18.4 | 1.0  | 0.0  | 0.0  | 9.2  | 0.0  | 6.4  |
| LnGrp Delay(d),s/veh         | 57.4  | 15.3 | 11.7 | 53.9 | 38.9  | 39.0 | 48.2 | 0.0  | 0.0  | 64.8 | 0.0  | 29.9 |
| LnGrp LOS                    | E     | B    | B    | D    | D     | D    | D    | D    | D    | E    |      | C    |
| Approach Vol, veh/h          | 1304  |      |      | 1221 |       |      | 33   |      |      | 520  |      |      |
| Approach Delay, s/veh        | 31.1  |      |      | 39.1 |       |      | 48.2 |      |      | 47.1 |      |      |
| Approach LOS                 | C     |      |      | D    |       |      | D    |      |      | D    |      |      |
| <b>Timer</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |
| Assigned Phs                 | 1     | 2    | 3    | 4    | 5     | 6    | 7    | 8    |      |      |      |      |
| Phs Duration (G+Y+Rc), s     | 8.0   | 63.7 |      | 23.1 | 22.3  | 49.4 | 13.1 |      |      |      |      |      |
| Change Period (Y+Rc), s      | * 4.7 | 5.8  |      | 5.1  | * 4.7 | 5.8  | 5.1  |      |      |      |      |      |
| Max Green Setting (Gmax), s  | * 9   | 58.4 |      | 19.9 | * 19  | 48.1 | 35.9 |      |      |      |      |      |
| Max Q Clear Time (g_c+1t), s | 2.9   | 17.2 |      | 17.4 | 17.1  | 36.3 | 3.9  |      |      |      |      |      |
| Green Ext Time (p_c), s      | 0.0   | 8.8  |      | 0.6  | 0.4   | 7.2  | 0.1  |      |      |      |      |      |
| <b>Intersection Summary</b>  |       |      |      |      |       |      |      |      |      |      |      |      |
| HCM 2010 Ctrl Delay          | 37.2  |      |      |      |       |      |      |      |      |      |      |      |
| HCM 2010 LOS                 | D     |      |      |      |       |      |      |      |      |      |      |      |
| <b>Notes</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |

HCM Signalized Intersection Capacity Analysis  
1: Sonoma Hwy (SR 12) & Middle Rincon Road

01/04/2021

| Movement                          | EBL   | EBT  | EBR                       | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-----------------------------------|-------|------|---------------------------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations               | ↔     | ↕    | ↔                         | ↔    | ↕     | ↔    |      |      | ↔    | ↕    | ↔    | ↕    |
| Traffic Volume (vph)              | 272   | 1240 | 20                        | 10   | 1309  | 161  | 0    | 0    | 1    | 181  | 5    | 179  |
| Future Volume (vph)               | 272   | 1240 | 20                        | 10   | 1309  | 161  | 0    | 0    | 1    | 181  | 5    | 179  |
| Ideal Flow (vphpl)                | 1900  | 1900 | 1900                      | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)               | 4.7   | 5.8  |                           | 4.7  | 5.8   |      |      | 4.0  |      |      | 5.1  |      |
| Lane Util. Factor                 | 1.00  | 0.95 |                           | 1.00 | 0.95  |      |      | 1.00 |      |      | 0.95 |      |
| Frt                               | 1.00  | 1.00 |                           | 1.00 | 0.98  |      |      | 0.85 |      |      | 0.93 |      |
| Flt Protected                     | 0.95  | 1.00 |                           | 0.95 | 1.00  |      |      | 1.00 |      |      | 0.98 |      |
| Satd. Flow (prot)                 | 1770  | 3531 |                           | 1770 | 3481  |      |      | 0    |      |      | 3200 |      |
| Flt Permitted                     | 0.95  | 1.00 |                           | 0.95 | 1.00  |      |      | 1.00 |      |      | 0.98 |      |
| Satd. Flow (perm)                 | 1770  | 3531 |                           | 1770 | 3481  |      |      | 0    |      |      | 3200 |      |
| Peak-hour factor, PHF             | 0.93  | 0.93 | 0.93                      | 0.93 | 0.93  | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)                   | 292   | 1333 | 22                        | 11   | 1408  | 173  | 0    | 0    | 1    | 195  | 5    | 192  |
| RTOR Reduction (vph)              | 0     | 0    | 0                         | 0    | 5     | 0    | 0    | 1    | 0    | 0    | 127  | 0    |
| Lane Group Flow (vph)             | 292   | 1355 | 0                         | 11   | 1576  | 0    | 0    | 0    | 0    | 0    | 265  | 0    |
| Turn Type                         | Prot  | NA   |                           | Prot | NA    |      |      |      |      | Perm | NA   |      |
| Protected Phases                  | 5     | 2    |                           | 1    | 6     |      |      |      |      |      | 4    |      |
| Permitted Phases                  | 4     |      |                           |      |       |      |      |      |      |      |      |      |
| Actuated Green, G (s)             | 23.0  | 79.8 |                           | 3.4  | 60.2  |      |      | 0.0  |      |      | 15.9 |      |
| Effective Green, g (s)            | 23.0  | 79.8 |                           | 3.4  | 60.2  |      |      | 0.0  |      |      | 15.9 |      |
| Actuated g/C Ratio                | 0.20  | 0.70 |                           | 0.03 | 0.52  |      |      | 0.00 |      |      | 0.14 |      |
| Clearance Time (s)                | 4.7   | 5.8  |                           | 4.7  | 5.8   |      |      |      |      |      | 5.1  |      |
| Vehicle Extension (s)             | 3.0   | 3.0  |                           | 3.0  | 3.0   |      |      |      |      |      | 3.0  |      |
| Lane Grp Cap (vph)                | 354   | 2456 |                           | 52   | 1826  |      |      | 0    |      |      | 443  |      |
| v/s Ratio Prot                    | c0.17 | 0.38 |                           | 0.01 | c0.45 |      |      |      |      |      |      |      |
| v/s Ratio Perm                    | 0.08  |      |                           |      |       |      |      |      |      |      |      |      |
| v/c Ratio                         | 0.82  | 0.55 |                           | 0.21 | 0.86  |      |      | 0.00 |      |      | 0.60 |      |
| Uniform Delay, d1                 | 43.9  | 8.6  |                           | 54.3 | 23.7  |      |      | 57.4 |      |      | 46.4 |      |
| Progression Factor                | 1.00  | 1.00 |                           | 1.00 | 1.00  |      |      | 1.00 |      |      | 1.00 |      |
| Incremental Delay, d2             | 14.4  | 0.3  |                           | 2.0  | 4.5   |      |      | 0.0  |      |      | 2.2  |      |
| Delay (s)                         | 58.3  | 8.9  |                           | 56.4 | 28.2  |      |      | 57.4 |      |      | 48.6 |      |
| Level of Service                  | E     | A    |                           | E    | C     |      |      | E    |      |      | D    |      |
| Approach Delay (s)                | 17.7  |      |                           |      | 28.4  |      |      |      | 57.4 |      | 48.6 |      |
| Approach LOS                      | B     |      |                           |      | C     |      |      |      | E    |      | D    |      |
| <b>Intersection Summary</b>       |       |      |                           |      |       |      |      |      |      |      |      |      |
| HCM 2000 Control Delay            | 25.7  |      | HCM 2000 Level of Service |      | C     |      |      |      |      |      |      |      |
| HCM 2000 Volume to Capacity ratio | 0.85  |      |                           |      |       |      |      |      |      |      |      |      |
| Actuated Cycle Length (s)         | 114.7 |      | Sum of lost time (s)      |      | 20.3  |      |      |      |      |      |      |      |
| Intersection Capacity Utilization | Err%  |      | ICU Level of Service      |      | H     |      |      |      |      |      |      |      |
| Analysis Period (min)             | 15    |      |                           |      |       |      |      |      |      |      |      |      |
| c Critical Lane Group             |       |      |                           |      |       |      |      |      |      |      |      |      |

HCM 2010 Signalized Intersection Summary  
2: Calistoga Road & Sonoma Hwy (SR 12)

01/04/2021

| Movement                     | EBL   | EBT  | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------------|-------|------|------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations          | ↔     | ↕    | ↔    | ↔    | ↕     | ↔    |      |      | ↔    | ↕    | ↔    | ↕    |
| Traffic Volume (veh/h)       | 456   | 875  | 18   | 53   | 958   | 269  | 14   | 6    | 5    | 317  | 8    | 386  |
| Future Volume (veh/h)        | 456   | 875  | 18   | 53   | 958   | 269  | 14   | 6    | 5    | 317  | 8    | 386  |
| Number                       | 5     | 2    | 12   | 1    | 6     | 16   | 3    | 8    | 18   | 7    | 4    | 14   |
| Initial Q (Qb), veh          | 0     | 0    | 0    | 0    | 0     | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Ped-Bike Adj(A_pbT)          | 1.00  |      | 0.98 | 1.00 |       | 0.99 | 1.00 |      | 0.99 | 1.00 |      | 1.00 |
| Parking Bus, Adj             | 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 Sat Flow, veh/h/ln       | 1845  | 1810 | 1863 | 1863 | 1817  | 1900 | 1900 | 1863 | 1900 | 1900 | 1845 | 1845 |
| Adj Flow Rate, veh/h         | 470   | 902  | 16   | 55   | 988   | 152  | 14   | 6    | 3    | 327  | 8    | 273  |
| Adj No. of Lanes             | 2     | 2    | 1    | 1    | 2     | 0    | 0    | 1    | 0    | 0    | 1    | 1    |
| 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 |
| Percent Heavy Veh, %         | 3     | 5    | 2    | 2    | 5     | 5    | 2    | 2    | 2    | 2    | 2    | 3    |
| Cap, veh/h                   | 566   | 1428 | 643  | 130  | 964   | 148  | 75   | 32   | 16   | 379  | 9    | 607  |
| Arrive On Green              | 0.17  | 0.42 | 0.42 | 0.07 | 0.32  | 0.32 | 0.07 | 0.07 | 0.07 | 0.22 | 0.22 | 0.22 |
| Sat Flow, veh/h              | 3408  | 3438 | 1547 | 1774 | 2994  | 460  | 1075 | 461  | 230  | 1717 | 42   | 1568 |
| Grp Volume(v), veh/h         | 470   | 902  | 16   | 55   | 569   | 571  | 23   | 0    | 0    | 335  | 0    | 273  |
| Grp Sat Flow(s),veh/h/ln     | 1704  | 1719 | 1547 | 1774 | 1726  | 1728 | 1766 | 0    | 0    | 1759 | 0    | 1568 |
| Q Serve(g_s), s              | 12.5  | 19.5 | 0.6  | 2.8  | 30.2  | 30.2 | 1.2  | 0.0  | 0.0  | 17.2 | 0.0  | 12.1 |
| Cycle Q Clear(g_c), s        | 12.5  | 19.5 | 0.6  | 2.8  | 30.2  | 30.2 | 1.2  | 0.0  | 0.0  | 17.2 | 0.0  | 12.1 |
| Prop In Lane                 | 1.00  |      | 1.00 | 1.00 |       | 0.27 | 0.61 |      | 0.13 | 0.98 |      | 1.00 |
| Lane Grp Cap(c), veh/h       | 566   | 1428 | 643  | 130  | 556   | 557  | 124  | 0    | 0    | 389  | 0    | 607  |
| V/C Ratio(X)                 | 0.83  | 0.63 | 0.02 | 0.42 | 1.02  | 1.03 | 0.19 | 0.00 | 0.00 | 0.86 | 0.00 | 0.45 |
| Avail Cap(c_a), veh/h        | 811   | 1548 | 697  | 195  | 556   | 557  | 676  | 0    | 0    | 467  | 0    | 677  |
| HCM Platoon Ratio            | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I)           | 1.00  | 1.00 | 1.00 | 1.00 | 1.00  | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh     | 37.8  | 21.7 | 16.2 | 41.6 | 31.8  | 31.8 | 41.1 | 0.0  | 0.0  | 35.1 | 0.0  | 21.3 |
| Incr Delay (d2), s/veh       | 5.0   | 0.9  | 0.0  | 2.2  | 44.3  | 44.7 | 0.7  | 0.0  | 0.0  | 13.3 | 0.0  | 0.5  |
| Initial Q Delay(d3),s/veh    | 0.0   | 0.0  | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| %ile BackOfQ(50%),veh/ln     | 6.3   | 9.5  | 0.2  | 1.4  | 21.1  | 21.1 | 0.6  | 0.0  | 0.0  | 9.8  | 0.0  | 5.3  |
| LnGrp Delay(d),s/veh         | 42.8  | 22.6 | 16.2 | 43.8 | 76.1  | 76.5 | 41.8 | 0.0  | 0.0  | 48.4 | 0.0  | 21.8 |
| LnGrp LOS                    | D     | C    | B    | D    | F     | F    | D    |      |      | D    |      | C    |
| Approach Vol, veh/h          | 1388  |      |      |      | 1195  |      |      |      | 23   |      | 608  |      |
| Approach Delay, s/veh        | 29.4  |      |      |      | 74.8  |      |      |      | 41.8 |      | 36.5 |      |
| Approach LOS                 | C     |      |      |      | E     |      |      |      | D    |      | D    |      |
| <b>Timer</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |
| Assigned Phs                 | 1     | 2    | 3    | 4    | 5     | 6    | 7    | 8    |      |      |      |      |
| Phs Duration (G+Y+Rc), s     | 11.6  | 44.7 |      | 25.8 | 20.3  | 36.0 | 11.7 |      |      |      |      |      |
| Change Period (Y+Rc), s      | * 4.7 | 5.8  |      | 5.1  | * 4.7 | 5.8  | 5.1  |      |      |      |      |      |
| Max Green Setting (Gmax), s  | * 10  | 42.2 |      | 24.9 | * 22  | 30.2 | 35.9 |      |      |      |      |      |
| Max Q Clear Time (g_c+I1), s | 4.8   | 21.5 |      | 19.2 | 14.5  | 32.2 | 3.2  |      |      |      |      |      |
| Green Ext Time (p_c), s      | 0.0   | 8.1  |      | 1.5  | 1.1   | 0.0  | 0.1  |      |      |      |      |      |
| <b>Intersection Summary</b>  |       |      |      |      |       |      |      |      |      |      |      |      |
| HCM 2010 Ctrl Delay          |       |      | 47.7 |      |       |      |      |      |      |      |      |      |
| HCM 2010 LOS                 |       |      | D    |      |       |      |      |      |      |      |      |      |
| <b>Notes</b>                 |       |      |      |      |       |      |      |      |      |      |      |      |

# Appendix C

---

## VMT Screen Map





**This page intentionally left blank**

