Revised Traffic Impact Analysis

Scenic Wonders Project

Located within the planning area of Yosemite West

In the County of Mariposa, California

Prepared for:

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September 27, 2022

Project No. 012-003

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This Revised Traffic Impact Analysis Report has been prepared under the direction of a licensed Traffic Engineer. The licensed Traffic Engineer attests to the technical information contained therein and has judged the qualifications of any technical specialists providing engineering data from which recommendations, conclusions, and decisions are based.

Prepared by:



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Introduction and Summary

Introduction

This Report describes a Revised Traffic Impact Analysis (TIA) prepared by JLB Traffic Engineering, Inc. (JLB) for the proposed Scenic Wonders Project located within the planning area of Yosemite West in unincorporated Mariposa County. The original TIA, submitted on December 4, 2020, is being revised due to the inclusion of additional parking spaces, to account for the added units in the Yosemite West Near Term project and to include discussions of the commercial laundry component of the Project. The area of operation is located approximately 18 miles from Badger Pass and 17 miles from the Yosemite Valley floor.

The Project proposes to construct support facilities in two (2) phases to aide in the operations and maintenance of the existing Home Rural Enterprise. The primary goals of the Project are to address the need for affordable housing for the local workforce, relocate existing dumpsters with bulk storage and significantly reduce local traffic related to housekeeping and laundry services in Yosemite West. The Project will also reduce the water and sewer flows of the local rental and vacation properties. The proposed development site is located on a 6.22-acre parcel (APN 006-150-003, 7548 Henness Circle, Yosemite, CA 95389), which is currently vacant and adjacent to the existing Yosemite West Condominiums used as vacation rentals. The site is located to the south of the fork of Henness Ridge Road and Henness Circle at the entrance of the Yosemite West area.

Phase I of the Project includes the immediate construction of a primary and auxiliary residence for long term rent, and a detached garage structure for storage. Phase II of the Project proposes to construct 15 additional, economy apartments which will be utilized for staff. These additional staff only units would include 11 one-bedroom units and four (4) two-bedroom units. The site would be occupied by approximately 32 employees who currently live in Yosemite West and 14 employees who commute from the community of Oakhurst. For purposes of this TIA, the Project assumes that Phase I and Phase II are constructed together. Based on information provided to JLB, the Project will undergo a General Plan Amendment through the County of Mariposa to further classify the mix of uses proposed under Phase II at a proposed density of 2.7 dwelling units per acre. Figure 1 shows the location of the proposed Project site relative to the surrounding roadway network.

The purpose of this TIA is to evaluate the potential on-site and off-site traffic impacts, identify short-term roadway and circulation needs, determine potential mitigation measures, and identify any critical traffic issues that should be addressed in the on-going planning process. The TIA primarily focused on evaluating traffic conditions at study intersections that may potentially be impacted by the proposed Project. The Report has been Revised to include the latest Project Site Plan and a qualitative analysis of vehicle miles traveled (VMT). The Scope of Work was prepared via consultation with County of Mariposa staff.

Summary

The potential traffic impacts of the proposed Project were evaluated in accordance with the standards set forth by the Level of Service (LOS) policy of the County of Mariposa and Caltrans and the Governor's Office of Planning and Research's Technical Advisory on Evaluating Transportation Impacts in CEQA.

Existing Traffic Conditions

- At present, all study intersections operate at an acceptable LOS during both peak periods.

Existing plus Project Traffic Conditions

- It was recommended that the brush and trees within the 155 feet corner sight distance triangles be removed as part of this Project to improve visibility and traffic safety. Since then, the Project has improved lines of sight by removing dead brush and trees and delimbing the areas of concern. The fuel reduction and forest cleanup of the Project site will increase sunshine exposure during the winter season increasing rates of snow melt and evaporation. In addition, the Project proponent has three (3) snowblower tractors and two (2) snowplow trucks that service the Yosemite West area. The Project proposes to plow and maintain its frontage to Henness Circle, driveway entrances and internal roadways thereby improving roadway conditions and safety during the winter season.
- JLB analyzed the location of the proposed access points relative to the existing local roads and driveways in the Project's vicinity. A review of the Project access points to be constructed indicates that they are located at points that minimize traffic operational impacts to the existing roadway network. However, to improve safety at the (one-way, stop-controlled) intersection of Henness Ridge Road and Henness Circle, it is recommended that the Project install signage to notify cross traffic does not stop.
- Based on the latest Project Site Plan, the Project proposes to include parking for 53 vehicles. Per the County of Mariposas Parking Standards, the Project is required to have 35 on-site parking spaces. Therefore, the Project proposes to provide eighteen (18) additional parking stalls.
- Per ITE, at buildout, the proposed Project is estimated to generate a maximum of 136 daily trips, 8 AM peak hour trips and 11 PM peak hour trips.
- The Project site is located within the Yosemite West area, which spans over a 0.5-mile radius, and will serve employees who currently live and work within the Yosemite West area. Moreover, daily trip generation rates for the Yosemite West area are significantly lower than those contained in the ITE Trip Generation Manual. When applying the daily trip generation rate observed in the Yosemite West area of 3.63 daily trips per dwelling unit, the proposed Project can be estimated to generate a maximum of 65 daily trips. Since the Project is estimated to yield fewer than 110 trips, the Project's VMT is considered less than significant.
- Under this scenario, all study intersections are projected to operate at an acceptable LOS during both peak periods.

Near Term No Project Traffic Conditions

- The total trip generation for the Near Term Projects is 511 daily trips, 48 AM peak hour trips and 56 PM peak hour trips.
- Under this scenario, all study intersections are projected to operate at an acceptable LOS during both peak periods.

Near Term plus Project Traffic Conditions

- Under this scenario, all study intersections are projected to operate at an acceptable LOS during both peak periods.

Cumulative Year 2040 No Project Traffic Conditions

- Under this scenario, all study intersections are projected to operate at an acceptable LOS during both peak periods.

Cumulative Year 2040 plus Project Traffic Conditions

- Under this scenario, all study intersections are projected to operate at an acceptable LOS during both peak periods.

Scope of Work

The TIA primarily focused on evaluating traffic conditions at study intersections that may potentially be impacted by the proposed Project. On August 14, 2019, a Draft Scope of Work for the preparation of a Traffic Impact Analysis for this Project was provided to the County of Mariposa for their review and comment. Any comments to the Draft Scope of Work were to be provided by September 4, 2019.

On August 20, 2019, the County of Mariposa responded to the Draft Scope of Work. The County requested that the TIA include a seven-day 24-hour volume counts to determine the busiest day of week and busiest hours during the peak day. The seven-day counts would also need to take into account the worst-case seasonal fluctuations. County staff also commented that the Project should consider limiting the number and type of access points to Henness Circle.

To address comments provided by the County, JLB obtained occupancy rate information in the Yosemite West area for Nightly Rental, Full-Time Private and Part-Time Private site units. The occupancy rates for these sites showed that the highest occupancy rates occur in the months of May and September. Given this information, JLB collected the seven-day 24-hour volume counts during Labor Day weekend (Saturday, August 31, 2019 through Friday, September 6, 2019) on Henness Ridge Drive west of Wawona Road. After thorough review of the seven-day 24-hour volume counts, JLB was able to determine the busiest day of the week and the busiest hours. The busiest days were Sunday, September 1, 2019 with 741 daily trips and Saturday, August 31, 2019 with 710 daily trips. The busiest periods were predominantly from 9 AM to 11 AM and 4 PM to 7 PM. Based on these findings, JLB provided the County of Mariposa with a Revised Draft Scope of Work on September 10, 2019 in which it was proposed to collect peak hour turning movement counts on a Sunday from 9 AM to 11 AM and 4 PM to 7 PM.

On September 18, 2019, the County of Mariposa responded to the Revised Draft Scope of Work and requested that JLB include a daily count at the same location to compare the counts for both days. Therefore, in addition to collecting an intersection turning movement count on Sunday, September 29, 2019 for the peak periods described above, JLB also collected a volume count at the same location between the hours of 9 AM and 7 PM. JLB compared the volume count collected on September 1st with that collected on September 29th. JLB found that between the hours of 9 AM and 7 PM, the count collected on September 1st was higher (575 trips) than that collected on September 29th (497 trips). Based on this finding, JLB increased the intersection turning movement count volumes by a ratio of 1.15 (573 ÷ 497 = 1.15) to assume the worst-case scenario. The Draft Scope of Work, the Revised Draft Scope of Work and the comments received for the County of Mariposa are included in Appendix A.

Study Facilities

The existing peak hour turning movement volume count and segment volume counts were conducted at the study intersection and segment in August 2019 and September 2019, while schools in the vicinity of the proposed Project were in session. The intersection turning movement counts included pedestrian volumes. The traffic counts for the existing study intersection and segment are contained in Appendix B. The existing intersection turning movement volumes, intersection geometrics and traffic controls are illustrated in Figure 2.

Study Intersections

1. Wawona Road (State Route 41) / Henness Ridge Drive

Study Scenarios

Existing Traffic Conditions

This scenario evaluates the Existing Traffic Conditions based on existing traffic volumes and roadway conditions from traffic counts and field surveys conducted in September 2019.

Existing plus Project Traffic Conditions

This scenario evaluates total traffic volumes and roadway conditions based on the Existing plus Project Traffic Conditions. The Existing plus Project traffic volumes were obtained by adding the Project Only Trips to the Existing Traffic Conditions scenario. The Project Only Trips to the study facilities were developed based on existing travel patterns, the existing roadway network, engineering judgment, data provided by the developer, knowledge of the study area.

Near Term No Project Traffic Conditions

This scenario evaluates total traffic volumes and roadway conditions based on the Near Term No Project Traffic Conditions. The Near Term No Project traffic volumes were obtained by adding the Near Term related trips to the Existing Traffic Conditions scenario.

Near Term plus Project Traffic Conditions

This scenario evaluates total traffic volumes and roadway conditions based on the Near Term plus Project Traffic Conditions. The Near Term plus Project traffic volumes were obtained by adding the Project Only Trips to the Near Term No Project Traffic Conditions scenario.

Cumulative Year 2040 No Project Traffic Conditions

This scenario evaluates total traffic volumes and roadway conditions based on the Cumulative Year 2040 No Project Traffic Conditions. The Cumulative Year 2040 No Project traffic volumes were obtained by subtracting the Project Only Trips from the Cumulative Year 2040 plus Project Traffic Conditions scenario.

Cumulative Year 2040 plus Project Traffic Conditions

This scenario evaluates total traffic volumes and roadway conditions based on the Cumulative Year 2040 plus Project Traffic Conditions. Based on a review of the Annual Average Daily Traffic (AADT) volumes obtained from Caltrans, the 10-year average annual growth rate of Wawona Road (State Route 41) was determined to be 1.5 percent near the vicinity of the proposed Project. Thus, JLB utilized an average annual growth rate of 1.5 percent to expand the existing traffic volumes by 22 years to arrive at the Cumulative Year 2040 traffic volumes. Finally, JLB added the Project Only Trips to the expanded existing traffic volumes to arrive at the Cumulative Year 2040 plus Project traffic volumes.

Level of Service Analysis Methodology

Level of Service (LOS) is a qualitative index of the performance of an element of the transportation system. LOS is a rating scale running from "A" to "F", with "A" indicating no congestion of any kind and "F" indicating unacceptable congestion and delays. LOS in this study describes the operating conditions for signalized and unsignalized intersections.

The *Highway Capacity Manual* (HCM) 6th Edition is the standard reference published by the Transportation Research Board and contains the specific criteria and methods to be used in assessing LOS. Synchro software was used to define LOS in this study. Details regarding these calculations are included in Appendix C.

Criteria of Significance

The County of Mariposa has established LOS D as the acceptable level of traffic congestion on county roads and streets. Therefore, LOS D threshold was utilized to evaluate the potential significance of LOS impacts to Mariposa County intersections outside of Caltrans' jurisdiction.

Caltrans endeavors to maintain a target LOS at the transition between LOS C and D on State highway facilities consistent with the *Caltrans Guide for the Preparation of Traffic Impact Studies* dated December 2002. However, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. Furthermore, the State Route 41 Transportation Concept reports have established LOS C as the concept LOS for State Route 41 within the community of Mariposa. In this TIA, the study facility falls within Caltrans' jurisdiction. Therefore, the Caltrans LOS C threshold was utilized as the criteria of significance for the study facility within Caltrans' jurisdiction.

Operational Analysis Assumptions and Defaults

The following operational analysis values, assumptions and defaults were used in this study to ensure a consistent analysis of LOS among the various scenarios.

- A 3 percent heavy vehicle factor
- At the existing intersection, the observed approach Peak Hour Factor (PHF) is utilized in the Existing, Existing plus Project, Near Term No Project and Near Term plus Project scenarios
- A PHF of 0.88, or the Existing PHF if higher, is utilized for the study intersection in the Cumulative Year 2040 scenarios

Existing Traffic Conditions

Roadway Network

The Project site and surrounding study area are illustrated in Figure 1. Important roadways serving the Project are discussed below.

Wawona Road (State Route 41) is an existing north-south two-lane principal arterial in the vicinity of the proposed Project site. In this area, Wawona Road is a two-lane undivided National Park Service Road between Yosemite National Park and the community of Wawona. The Transportation Concept Report for State Route 41 designates the segment of State Route 41 between the Madera/Mariposa County Line and Yosemite National Park as a two-lane undivided principal arterial.

Henness Ridge Drive is an existing east-west undivided two-lane local roadway adjacent to the proposed Project site. In this area, Henness Ridge Drive extends west of State Route 41 and connects to Henness Circle to the southwest.

Traffic Signal Warrants

The peak hour traffic signal warrant was prepared for the unsignalized intersection in the Existing Traffic Conditions scenario. This warrant is found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersection of Wawona Road and Henness Ridge Drive does not satisfy the signal warrant during either peak period. Based on the signal warrant and engineering judgement, signalization of this intersection is not recommended, especially since this intersection operates at an acceptable LOS during both peak periods.

Results of Existing Level of Service Analysis

Figure 2 illustrates the Existing Traffic Conditions turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Existing Traffic Conditions scenario are provided in Appendix D. Table I presents a summary of the Existing peak hour LOS at the study intersection.

Under this scenario, the intersection of Wawona Road and Henness Ridge Drive operates at an acceptable LOS during both peak periods.

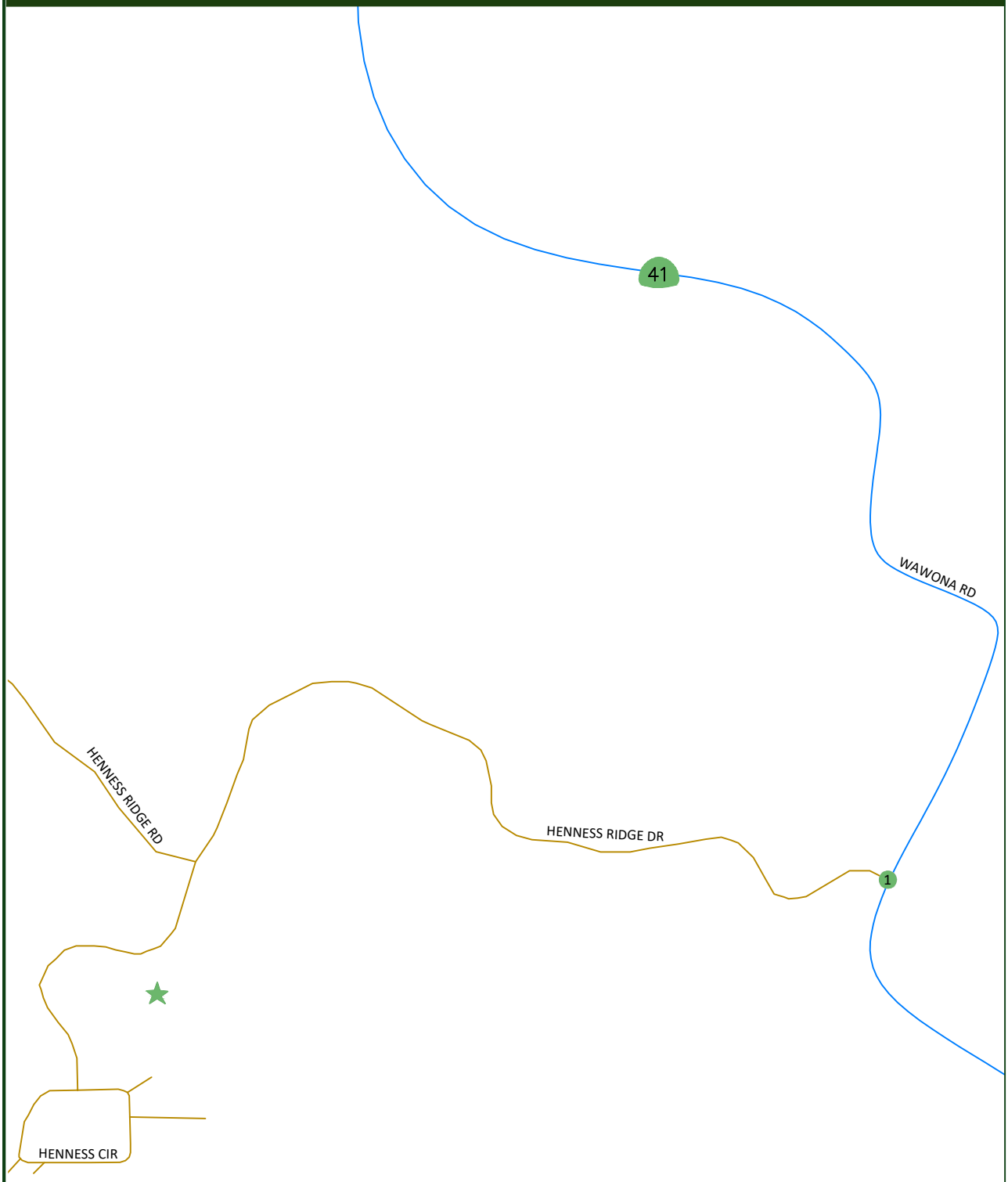
Table I: Existing Intersection LOS Results

ID	*Intersection*	*Intersection Control*	*AM (9 - 11) Peak Hour*		*PM (4 - 7) Peak Hour*	
			Average Delay (sec/veh)	*LOS*	*Average Delay (sec/veh)*	*LOS*
1	Wawona Road / Henness Ridge Drive	Two-Way Stop	12.1	B	11.1	B

Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls
LOS for two-way and one-way STOP controlled intersections are based on the worst approach/movement of the minor street.

LeBlanc - County of Mariposa
Vicinity Map

Figure 1



LEGEND

★ = PROJECT LOCATION

(#) = STUDY INTERSECTION

N

Not To Scale

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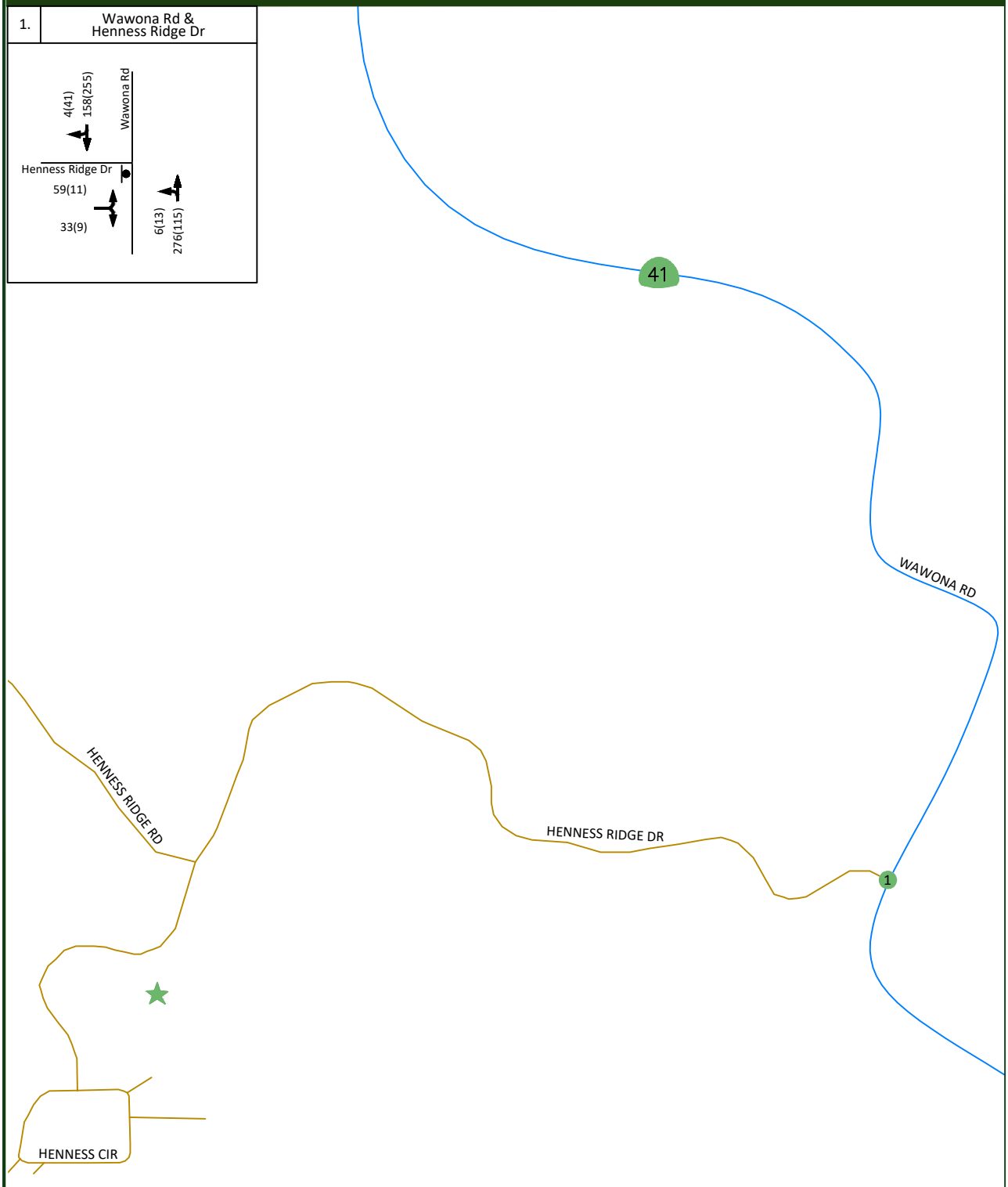
LeBlanc - County of Mariposa
Existing - Traffic Volumes, Geometrics and Controls

Figure 2



LEGEND

- ★ = PROJECT LOCATION
- # = STUDY INTERSECTION
- ● = STOP SIGN
- XX = AM PEAK HOUR TRIPS
- (XX) = PM PEAK HOUR TRIPS

N

Not To Scale

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Existing plus Project Traffic Conditions

Project Description

The Project proposes to construct support facilities in two (2) phases to aide in the operations and maintenance of the existing Home Rural Enterprise. The primary goals of the Project are to address the need for affordable housing for the local workforce, relocate existing dumpsters with bulk storage and significantly reduce local traffic related to housekeeping and laundry services in Yosemite West. The Project will also reduce the water and sewer flows of the local rental and vacation properties. The proposed development site is located on a 6.22-acre parcel (APN 006-150-003, 7548 Henness Circle, Yosemite, CA 95389), which is currently vacant and adjacent to the existing Yosemite West Condominiums used as vacation rentals. The site is located to the south of the fork of Henness Ridge Road and Henness Circle at the entrance of the Yosemite West area.

Phase I of the Project includes the immediate construction of a primary and auxiliary residence for long term rent, and a detached garage structure for storage. Phase II of the Project proposes to construct 15 additional, economy apartments which will be utilized for staff. These additional staff only units would include 11 one-bedroom units and four (4) two-bedroom units. The site would be occupied by approximately 32 employees who currently live in Yosemite West and 14 employees who commute from the community of Oakhurst. For purposes of this TIA, the Project assumes that Phase I and Phase II are constructed together. Based on information provided to JLB, the Project will undergo a General Plan Amendment through the County of Mariposa to further classify the mix of uses proposed under Phase II at a proposed density of 2.7 dwelling units per acre. Figure 3 illustrates the latest Project Site Plan.

Laundry Trip Reduction

The current practice of doing laundry at each vacation rental requires housekeeping staff to run two to five loads of laundry between guest stays at each residence. The real-life condition is that the staff immediately starts laundry and then cleans the rental while changing loads of laundry. Two to four round trips are required instead of one round trip by housekeeping staff for each guest reservation. This is true regardless of the vacation rental is managed by Scenic Wonders or by other management services. The proposed laundry system will significantly reduce traffic within the Yosemite West community.

Scenic Wonders managed 6,896 home reservations in Yosemite West in 2021. We estimate that doing the laundry at each home created an approximately 2.75 trips per reservation to each property by housekeeping staff. The proposed Scenic Wonders laundry facility will reduce that to one round housekeeping trip per cleaning/reservation since the housekeeper will bring fresh laundry, clean the unit and take the soiled laundry in a single round trip for each reservation. Therefore, the addition of a laundry facility will reduce the number of internal trips within the Yosemite West community.

Project Access

Based on the latest Project Site Plan, access to and from the Project site will be from a total of four (4) access points located along the southeast side of Henness Circle. The westmost proposed access point (Access 4) is located approximately 950 feet south of Henness Ridge Road and provides access to the dumpster storage area. Access 4 features a large apron for regular dumpster service without vehicles backing out into Henness Circle. Approximately 850 feet south of Henness Ridge Road is another access (Access 3) to a detached garage, laundry, and fuel storage for Building 3. Approximately 600 feet south of Henness Ridge Road is an entrance only driveway (Access 2) for the primary residence. This access point is part of a looped driveway that provides backing distance into the Project site to allow for access to the roadway without backing up. The exit to the looped driveway is the east most proposed access point (Access 1) that is located approximately 450 feet south of Henness Ridge Road and is proposed as a full access. A prior version of the Project Site Plan proposed two (2) access points between the looped driveway entrance points to serve the primary residence. The latest version of the Project Site Plan proposes to eliminate access to parking at Access 1 by proposing to install a raised concrete curb along the east side of Henness Circle. All proposed roadways will be asphalt-paved and 24-feet wide with integrated drainage curbs. The latest Project Site Plan incorporates CalFire comments pertaining to the "T" intersection near the auxiliary residence.

JLB also conducted a corner sight distance evaluation of each of the proposed project driveways. For this task, JLB assumed that the design speed for the corner sight distance evaluation would be 25 MPH. As a result, a corner sight distance of 155 feet would be desirable. Based on JLB's observations, all proposed driveway locations would yield an unobstructed view of 155 feet or more with one exception. The exception was at the driveway that would serve the entrance to the detached garage for Building 3. The lines of sight looking east and west are currently partially obstructed by low brush and trees. It was recommended that the brush and trees within the 155 feet corner sight distance triangles be removed as part of this Project to improve visibility and traffic safety. Since then, the Project has improved lines of sight by removing dead brush and trees and delimbing the areas of concern. The fuel reduction and forest cleanup of the Project will increase sunshine exposure during the winter season increasing rates of snow melt and evaporation. In addition, the Project proponent has three (3) snowblower tractors and two (2) snowplow trucks that service the Yosemite West area. The Project proposes to plow and maintain its frontage to Henness Circle, driveway entrances and internal roadways thereby improving roadway conditions and safety during the winter season.

JLB analyzed the location of the proposed access points relative to the existing local roads and driveways in the Project's vicinity. A review of the Project access points to be constructed indicates that they are located at points that minimize traffic operational impacts to the existing roadway network. However, to improve safety at the (one-way, stop-controlled) intersection of Henness Ridge Road and Henness Circle, it is recommended that the Project install signage to notify cross traffic does not stop.

Parking Supply

Based on the latest Project Site Plan, the Project proposes to include parking for 53 vehicles. Per the County of Mariposas Parking Standards, studio and one-bedroom apartments require one and a half (1.5) parking spaces per unit, and two or more bedroom apartments and single-family residential homes require two (2) parking spaces per unit and one (1) space for each bedroom over 2 bedrooms. Based on the latest Project Site Plan, the Project proposes to construct eleven (11) one-bedroom apartments requiring a need for 17 (seventeen) parking spaces, four (4) two or more bedroom apartments requiring a need for eight (8) parking spaces and two (2) single-family housing units requiring a need for ten (10) parking spaces. Therefore, considering County of Mariposa Parking Standards, the Project proposes to provide eighteen (18) additional parking stalls (53 proposed stalls – 35 required stalls = 18 additional stalls).

Trip Generation

The trip generation rates for the proposed Project were obtained from the 10th Edition of the Trip Generation Manual published by the Institute of Transportation Engineers (ITE). According to the ITE Trip Generation Manual, time-of-day distribution data on a weekday for Multifamily Housing (Low-Rise) takes place between 7:15 and 8:15 AM and 4:45 and 5:45 PM. Also, time-of-day distribution data on a weekday for Single-Family Detached Housing takes place between 7:15 and 8:15 AM and 4:00 and 5:00 PM. Additionally, geographic location and type of adjacent and nearby development are noted to have an effect on the site trip generation. Further, many of the ITE trip generation studies were located in urban and suburban settings, which are anticipated to yield higher trip generation as a result of work and school related trips.

This Report makes the following trip generation assumptions:

- The AM hour in which the highest traffic volumes for the single-family detached housing land use are observed do not coincide with the AM period that is analyzed in this report. In order to be conservative, this TIA assumes the highest trip generation will occur during the AM period that is analyzed in this report.
- Based on occupancy estimations at the time of the collection of the counts, trip generation in the Yosemite West area was observed to yield approximately 3.63 daily trips per dwelling unit. This is largely due to the fact that approximately 80 percent of homes are transient use homes. The observed daily trip generation of 3.63 trips per unit is approximately half of that contained in the ITE Trip Generation Manual. While both Project residences are proposed to be transient use homes, this TIA assumes the trip generation rates presented in the ITE Trip Generation Manual.

Table II presents the trip generation for the proposed Project with trip generation rates for Multifamily Housing (Low-Rise) and Single-Family Detached Housing. Per ITE, at buildout, the proposed Project is estimated to generate a maximum of 136 daily trips, 8 AM peak hour trips and 11 PM peak hour trips.

Table II: Project Trip Generation

Land Use (ITE Code)	Size	Unit	Daily		AM (9 - 11) Peak Hour						PM (4 - 7) Peak Hour					
			Rate	Total	Trip Rate	In %	Out %	In	Out	Total	Trip Rate	In %	Out %	In	Out	Total
Multifamily Housing (Low-Rise) (220)	16	d.u.	7.32	117	0.46	23	77	2	5	7	0.56	63	37	6	3	9
Single-Family Detached Housing (210)	2	d.u.	9.44	19	0.74	25	75	0	1	1	0.99	63	37	1	1	2
Total Project Trips				**136**				**2**	**6**	**8**				**7**	**4**	**11**

Note: d.u. = Dwelling Units

Trip Distribution

The trip distribution assumptions were developed based on existing travel patterns, the existing roadway network, engineering judgment, data provided by the developer, and knowledge of the study area. Figure 4 illustrates the Project Only Trips to the study intersections.

Traffic Signal Warrants

The peak hour traffic signal warrant was prepared for the unsignalized intersection in the Existing plus Project Traffic Conditions scenario. This warrant is found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersection of Wawona Road and Henness Ridge Drive is not projected to satisfy the signal warrant during either peak period. Based on the signal warrant and engineering judgement, signalization of this intersection is not recommended, especially since this intersection is projected to operate at an acceptable LOS during both peak periods.

Vehicle Miles Traveled Analysis

Senate Bill (SB) 743 (Steinberg 2013) was approved by then Governor Brown on September 27, 2013. SB 743 created a path to revise the definition of transportation impacts according to the California Environmental Quality Act (CEQA). The revised CEQA Guidelines requiring Vehicle Miles Traveled (VMT) Analysis became effective December 28, 2018. However, agencies had until July 1, 2020 to finalize their local guidelines on VMT Analysis. Therefore, as agencies finalize their VMT Analysis protocol, CEQA transportation impacts are to be determined using LOS of intersections and roadways, which is a measure of congestion. The intent of SB 743 is to align CEQA transportation study methodology with and promote the statewide goals and policies of reducing VMT and greenhouse gases (GHG). Three objectives of SB 743 related to development are to reduce GHG, diversify land uses, and focus on creating a multimodal environment. It is hoped that this will spur infill development.

The State of California Governor's Office of Planning and Research (OPR) published a Technical Advisory (TA) on *Evaluating Transportation Impacts in CEQA* (December 2018) to provide advice and recommendations, which agencies and other entities may use at their discretion. The TA acknowledges that lead agencies should set criteria and thresholds for VMT and transportation impacts. However, it provides guidance to residential, office and retail uses, citing these as the most common land uses. Beyond these three land uses, there is no guidance provided for any other land use type. The TA also notes that land uses may have a less than significant impact if located within a low VMT areas, in close proximity to a transit route, areas of a region and suggests that screening maps be used for this determination. Furthermore, the TA also notes that local serving retail generally less than 50,000 square feet and projects which yield 110 or fewer trips could be considered not to lead to a significant impact. As of the date of this Report, the County of Mariposa had not finalized its VMT guidelines. As a result, the VMT analysis presented in this Report was performed pursuant to OPR's TA.

VMT is simply the product of a number of trips and the length of those trips. The first step in a VMT analysis is to establish the baseline average VMT, which requires the definition of a region. The TA states that existing VMT may be measured at the regional or city level. On the contrary, the TA also notes that VMT analyses should not be truncated due to "jurisdictional or other boundaries." In this case, the Project site is located within the Yosemite West area, which spans over a 0.5-mile radius. The Project will serve 32 employees who currently live in Yosemite West and 14 employees who commute from the community of Oakhurst. Moreover, daily trip generation rates for the Yosemite West area are significantly lower than those contained in the ITE Trip Generation Manual. When applying the daily trip generation rate observed in the Yosemite West area of 3.63 daily trips per dwelling unit, the proposed Project can be estimated to generate a maximum of 65 daily trips. Since the Project is estimated to yield fewer than 110 trips, the Project's VMT is considered less than significant per OPR's TA.

Results of Existing plus Project Level of Service Analysis

The Existing plus Project Traffic Conditions scenario assumes that the existing roadway geometrics and traffic controls will remain in place. Figure 5 illustrates the Existing plus Project turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Existing plus Project Traffic Conditions scenario are provided in Appendix E. Table III presents a summary of the Existing plus Project peak hour LOS at the study intersection.

Under this scenario, the intersection of Wawona Road and Henness Ridge Drive is projected to operate at an acceptable LOS during both peak periods.

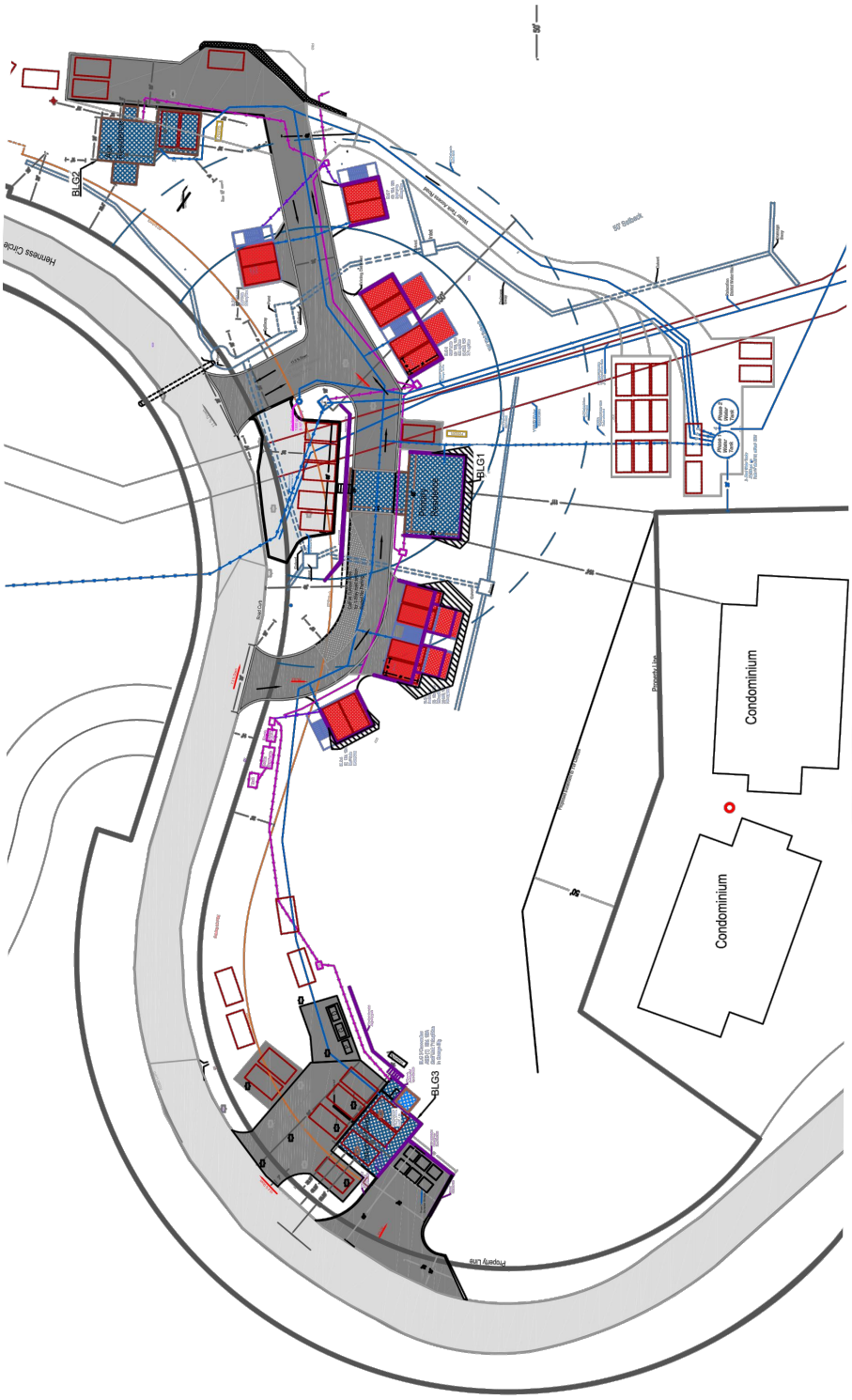
Table III: Existing plus Project Intersection LOS Results

ID	*Intersection*	*Intersection Control*	*AM (9 - 11) Peak Hour*		*PM (4 - 7) Peak Hour*	
			Average Delay (sec/veh)	*LOS*	*Average Delay (sec/veh)*	*LOS*
1	Wawona Road / Henness Ridge Drive	Two-Way Stop	12.2	B	11.2	B

Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls
LOS for two-way and one-way STOP controlled intersections are based on the worst approach/movement of the minor street.

LeBlanc TIA - County of Mariposa
Project Site Plan

Figure 3



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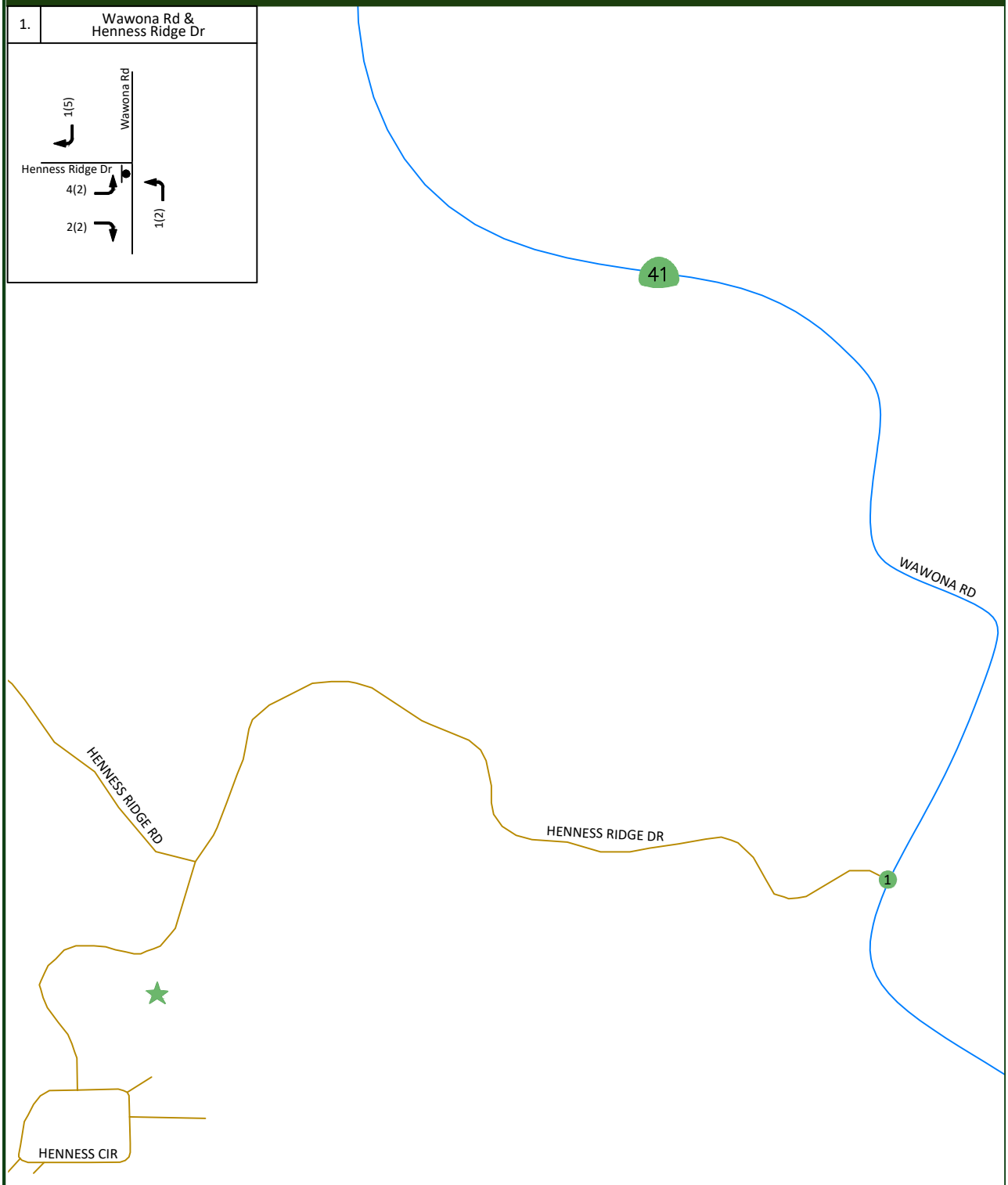
Not To Scale

LeBlanc - County of Mariposa
Project Only Trips

Figure 4



LEGEND

- ★ = PROJECT LOCATION
- (#) = STUDY INTERSECTION
- = STOP SIGN
- XX = AM PROJECT ONLY TRIPS
- (XX) = PM PROJECT ONLY TRIPS

N

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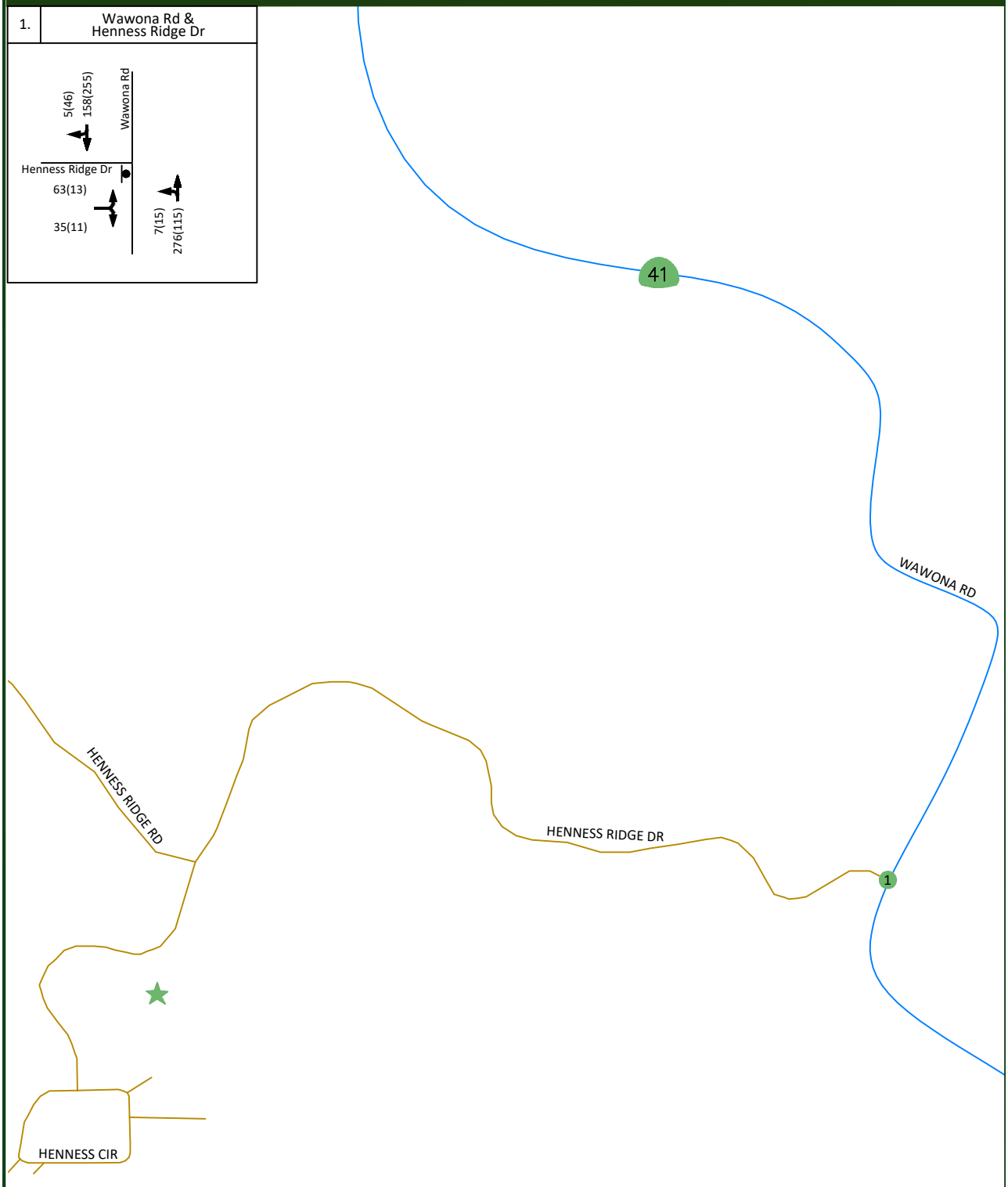
LeBlanc - County of Mariposa
Existing plus Project - Traffic Volumes, Geometrics and Controls

Figure 5



LEGEND

- ★ = PROJECT LOCATION
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- XX = AM PEAK HOUR TRIPS
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Near Term No Project Traffic Conditions

Description of Approved and Pipeline Projects

Approved and Pipeline Projects consist of developments that are either under construction, built but not fully occupied, are not built but have final site development review (SDR) approval, or for which the lead agency or responsible agencies have knowledge of. County of Mariposa staff were consulted throughout the preparation of this TIA regarding approved and/or known of projects that could potentially impact the study intersection. Therefore, the Near Term Projects listed in Table IV were the only projects approved, near approval, or in the pipeline within the proximity of the Project site.

The trip generation listed in Table IV is that which is anticipated to be added to the streets and highways by these projects between the time of the preparation of this report and the year 2025. As shown in Table IV, the total trip generation for the Near Term Projects is 511 daily trips, 48 AM peak hour trips and 56 PM peak hour trips. Figure 6 illustrates the location of the approved, near approval, or pipeline projects and their combined trip assignment to the study intersections under the Near Term scenarios.

Table IV: Near Term Projects' Trip Generation

Approved Project Location	*Approved or Pipeline Project Name*	*Daily Trips*	*AM Peak Hour*	*PM Peak Hour*
A	Yosemite West I & II[1]	475	30	38
B	Yosemite Institute of Environmental Education[2]	36	18	18
Total Approved and Pipeline Project Trips		**511**	**48**	**56**

Note: 1 = Trip Generation prepared by JLB Traffic Engineering, Inc. based on readily available information
2 = Trip Generation based on Omni-Means Traffic Impact Analysis Report

Traffic Signal Warrants

The peak hour traffic signal warrant was prepared for the unsignalized intersection in the Near Term No Project Traffic Conditions scenario. These warrants are found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersection of Wawona Road and Henness Ridge Drive is not projected to satisfy the signal warrant during either peak period. Based on the signal warrant and engineering judgement, signalization of this intersection is not recommended, especially since this intersection is projected to operate at an acceptable LOS during both peak periods.

Results of Near Term No Project Level of Service Analysis

The Near Term No Project Traffic Conditions scenario assumes that the existing roadway geometrics and traffic controls will remain in place. Figure 7 illustrates the Near Term No Project turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Near Term No Project Traffic Conditions scenario are provided in Appendix F. Table V presents a summary of the Near Term No Project peak hour LOS at the study intersections.

Under this scenario, the intersection of Wawona Road and Henness Ridge Drive is projected to operate at an acceptable LOS during both peak periods.

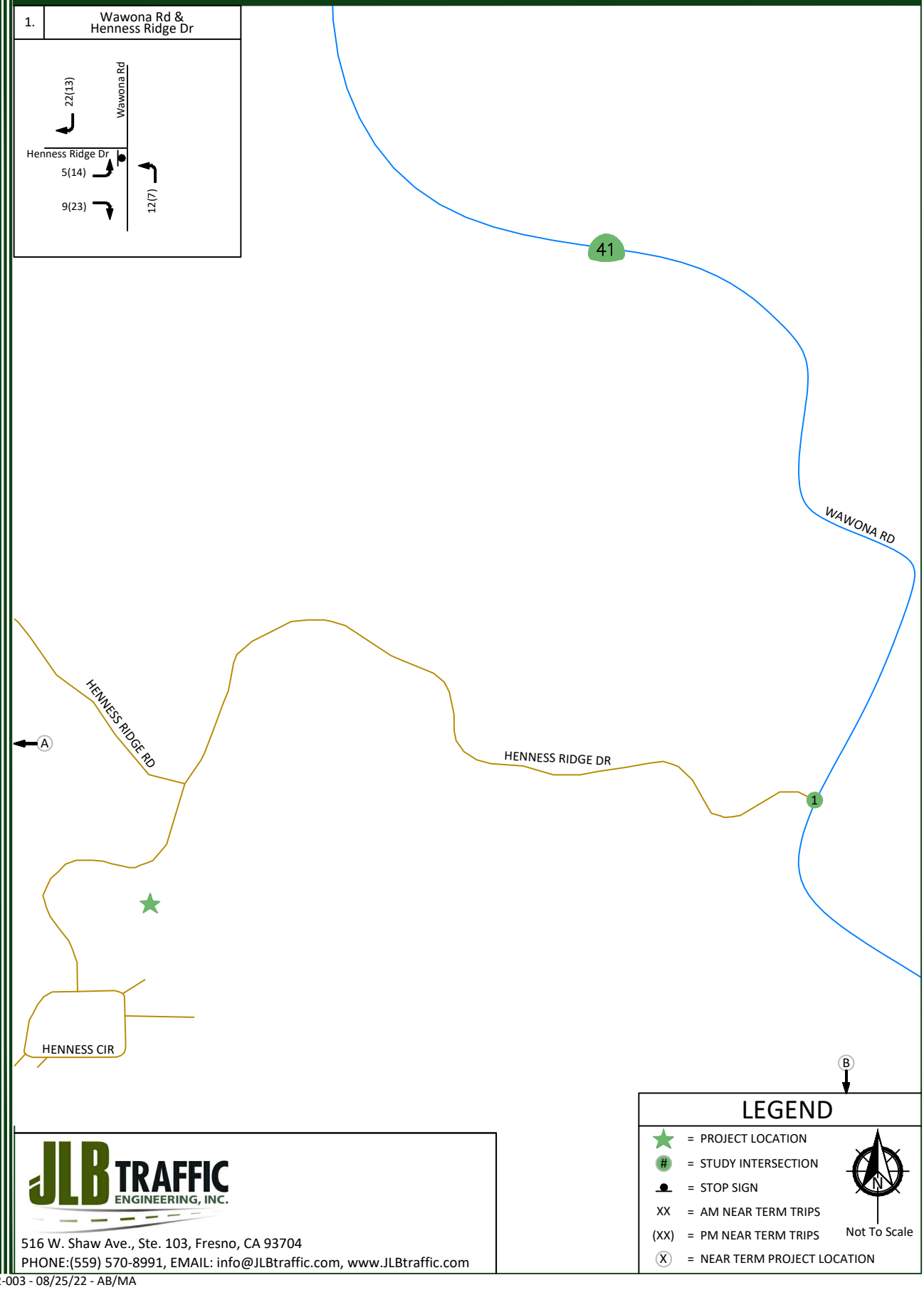
Table V: Near Term No Project Intersection LOS Results

ID	*Intersection*	*Intersection Control*	*AM (9 - 11) Peak Hour*		*PM (4 - 7) Peak Hour*	
			Average Delay (sec/veh)	*LOS*	*Average Delay (sec/veh)*	*LOS*
1	Wawona Road / Henness Ridge Drive	Two-Way Stop	12.6	B	11.5	B

Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls
LOS for two-way and one-way STOP controlled intersections are based on the worst approach/movement of the minor street.

LeBlanc - County of Mariposa
Near Term Projects' Trip Assignment

Figure 6



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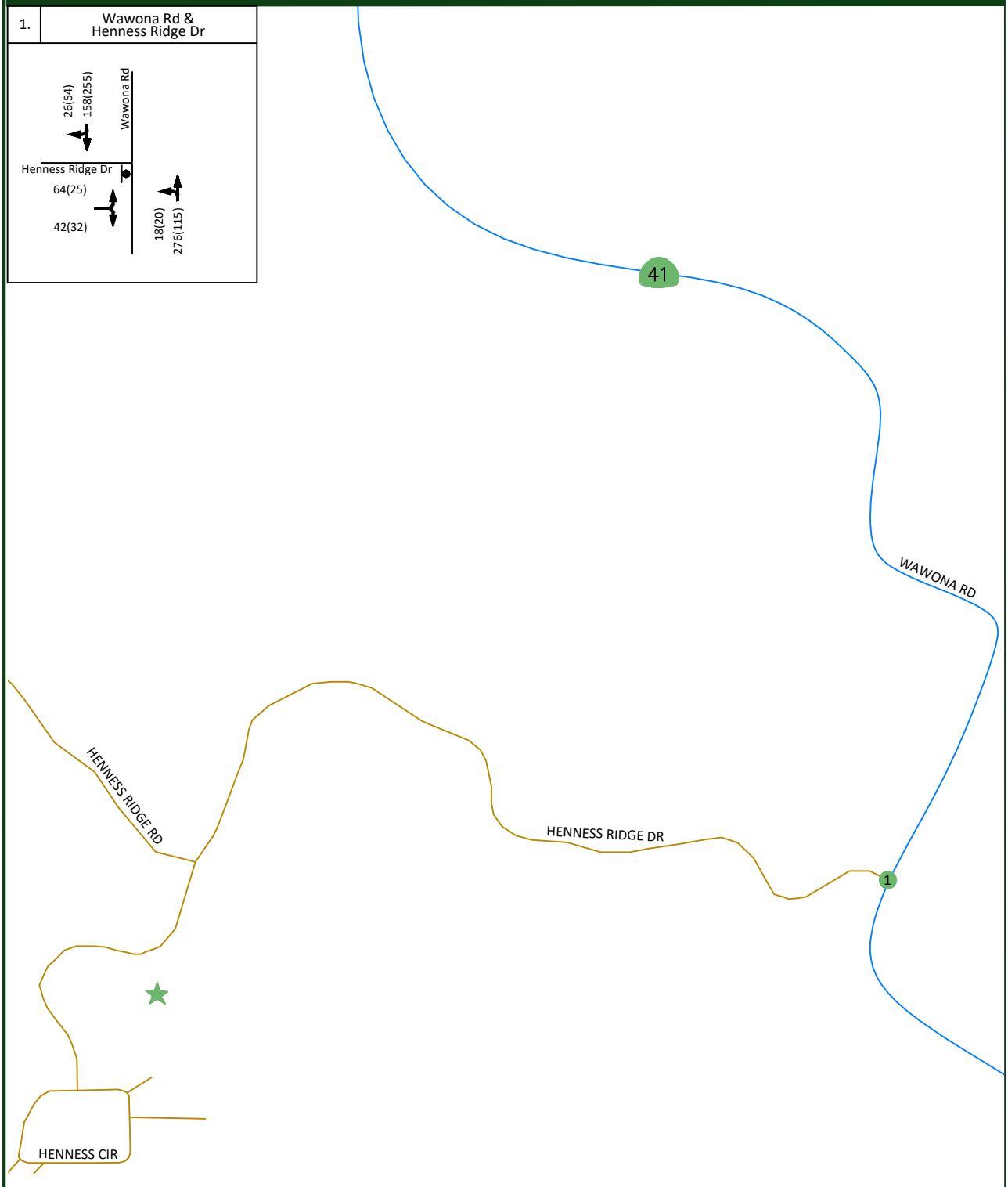
LeBlanc - County of Mariposa
Near Term No Project - Traffic Volumes, Geometrics and Controls

Figure 7



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Near Term plus Project Traffic Conditions

Traffic Signal Warrants

The peak hour traffic signal warrant was prepared for the unsignalized intersection in the Near Term plus Project Traffic Conditions scenario. This warrant is found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersection of Wawona Road and Henness Ridge Drive is not projected to satisfy the signal warrant during either peak period. Based on the signal warrant and engineering judgement, signalization of this intersection is not recommended, especially since this intersection is projected to operate at an acceptable LOS during both peak periods.

Results of Near Term plus Project Level of Service Analysis

The Near Term plus Project Traffic Conditions scenario assumes that the existing roadway geometrics and traffic controls will remain in place. Figure 8 illustrates the Near Term plus Project turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Near Term plus Project Traffic Conditions scenario are provided in Appendix G. Table VI presents a summary of the Near Term plus Project peak hour LOS at the study intersection.

Under this scenario, the intersection of Wawona Road and Henness Ridge Drive is projected to operate at an acceptable LOS during both peak periods.

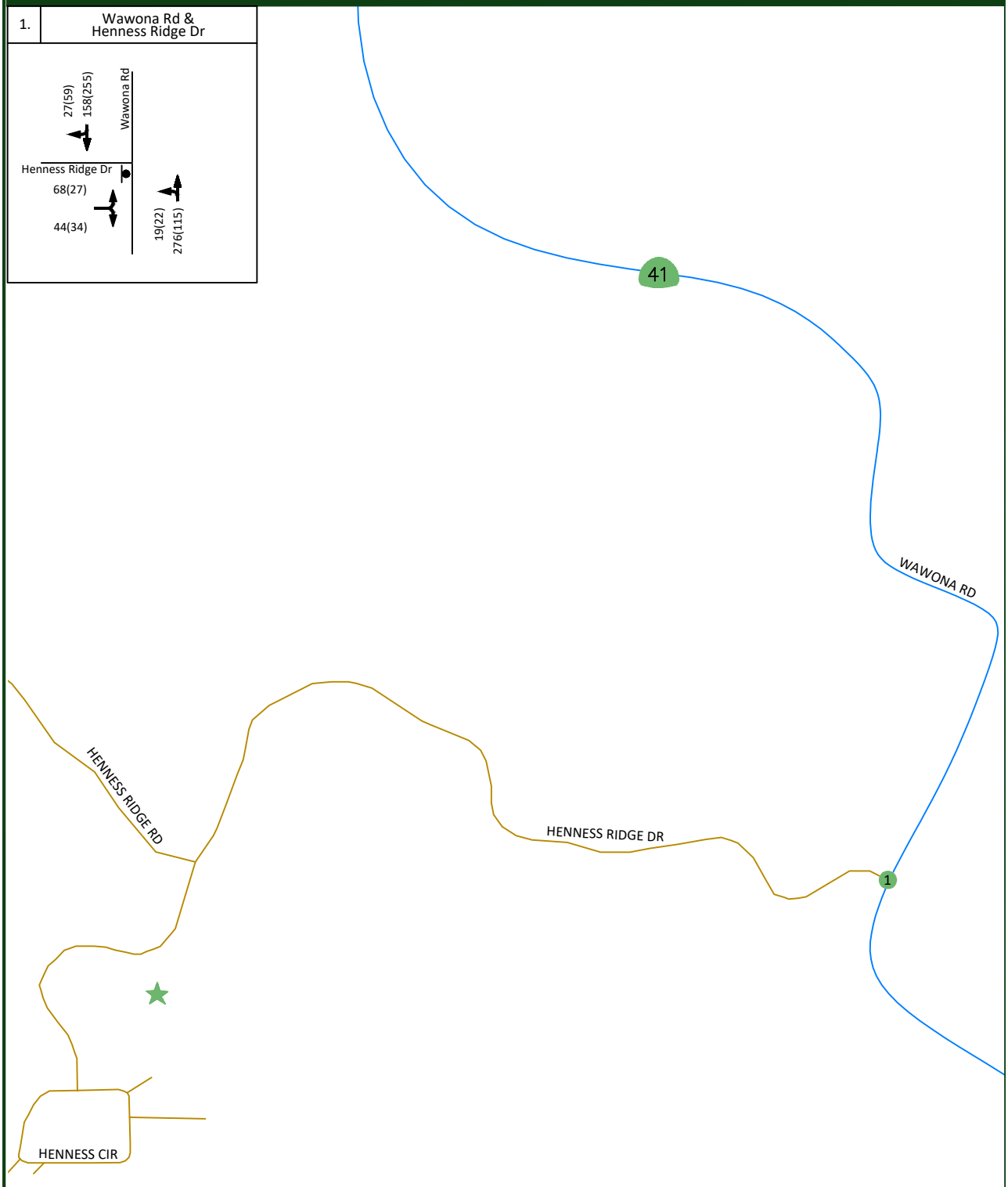
Table VI: Near Term plus Project Intersection LOS Results

ID	*Intersection*	*Intersection Control*	*AM (9 - 11) Peak Hour*		*PM (4 - 7) Peak Hour*	
			Average Delay (sec/veh)	*LOS*	*Average Delay (sec/veh)*	*LOS*
1	Wawona Road / Henness Ridge Drive	Two-Way Stop	12.8	B	11.6	B

Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls
LOS for two-way and one-way STOP controlled intersections are based on the worst approach/movement of the minor street.

LeBlanc - County of Mariposa
Near Term plus Project - Traffic Volumes, Geometrics and Controls

Figure 8



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Cumulative Year 2040 No Project Traffic Conditions

Traffic Signal Warrants

The peak hour traffic signal warrant was prepared for the unsignalized intersection in the Cumulative Year 2040 No Project Traffic Conditions scenario. This warrant is found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersection of Wawona Road and Henness Ridge Drive is not projected to satisfy the signal warrant during either peak period. Based on the signal warrant and engineering judgement, signalization of this intersection is not recommended, especially since this intersection is projected to operate at an acceptable LOS during both peak periods.

Results of Cumulative Year 2040 No Project Level of Service Analysis

The Cumulative Year 2040 No Project Traffic Conditions scenario assumes that the existing roadway geometrics and traffic controls will remain in place. Figure 9 illustrates the Cumulative Year 2040 No Project turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Cumulative Year 2040 No Project Traffic Conditions scenario are provided in Appendix H. Table VII presents a summary of the Cumulative Year 2040 No Project peak hour LOS at the study intersections.

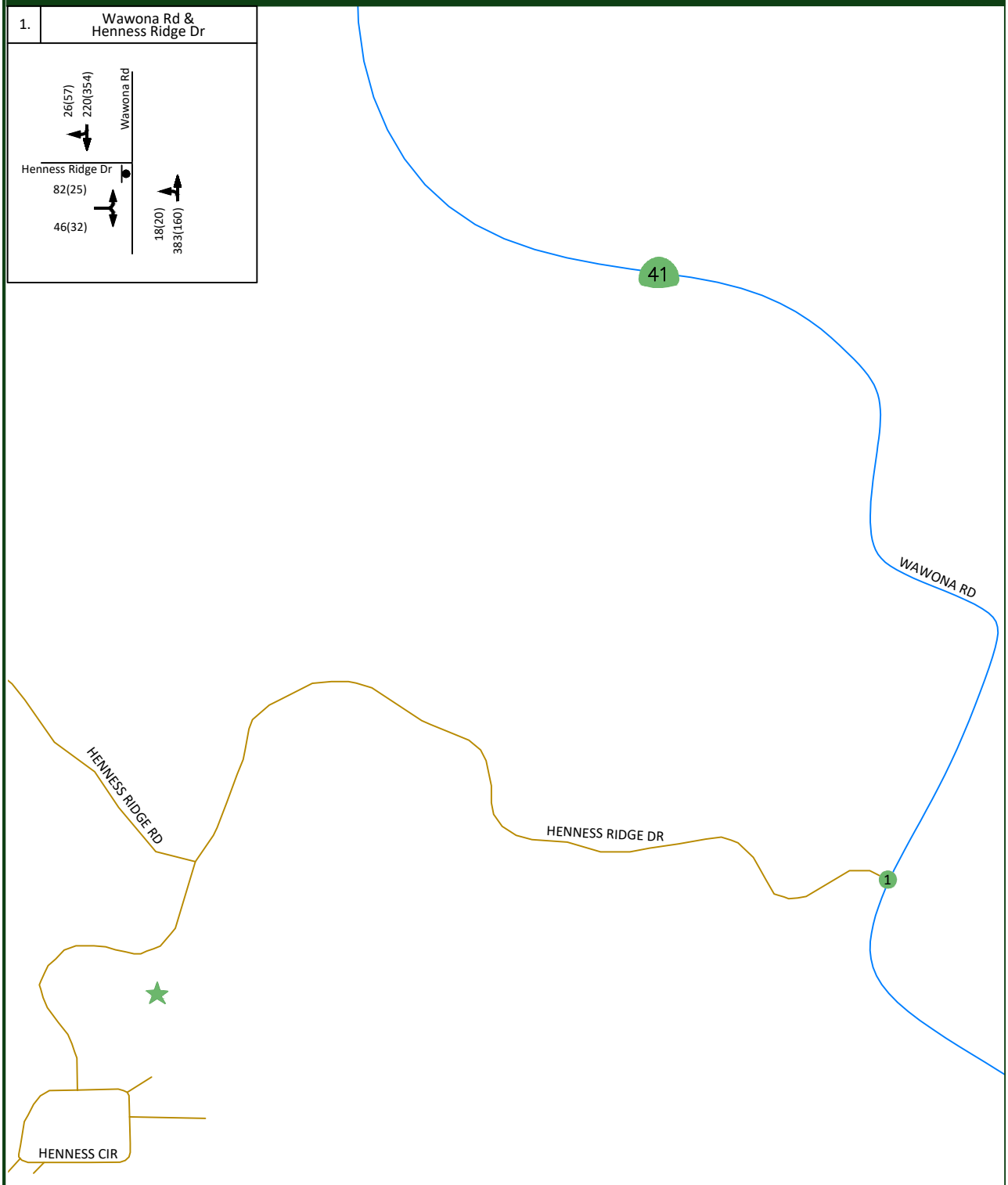
Under this scenario, the intersection of Wawona Road and Henness Ridge Drive is projected to operate at an acceptable LOS during both peak periods.

Table VII: Cumulative Year 2040 No Project Intersection LOS Results

ID	*Intersection*	*Intersection Control*	*AM (9 - 11) Peak Hour*		*PM (4 - 7) Peak Hour*	
			Average Delay (sec/veh)	*LOS*	*Average Delay (sec/veh)*	*LOS*
1	Wawona Road / Henness Ridge Drive	Two-Way Stop	16.0	C	13.0	B

Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls
LOS for two-way and one-way STOP controlled intersections are based on the worst approach/movement of the minor street.

LeBlanc - County of Mariposa
Figure 9
Cumulative Year 2040 No Project - Traffic Volumes, Geometrics and Controls



LEGEND

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- # = STUDY INTERSECTION
- = STOP SIGN
- XX = AM PEAK HOUR TRIPS
- (XX) = PM PEAK HOUR TRIPS

N

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Cumulative Year 2040 plus Project Traffic Conditions

Traffic Signal Warrants

The peak hour traffic signal warrant was prepared for the unsignalized intersection in the Cumulative Year 2040 plus Project Traffic Conditions scenario. This warrant is found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersection of Wawona Road and Henness Ridge Drive is not projected to satisfy the signal warrant during either peak period. Based on the signal warrant and engineering judgement, signalization of this intersection is not recommended, especially since this intersection is projected to operate at an acceptable LOS during both peak periods.

Results of Cumulative Year 2040 plus Project Level of Service Analysis

The Cumulative Year 2040 plus Project Traffic Conditions scenario assumes that the existing roadway geometrics and traffic controls will remain in place. Figure 10 illustrates the Cumulative Year 2040 plus Project turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Cumulative Year 2040 plus Project Traffic Conditions scenario are provided in Appendix I. Table VIII presents a summary of the Cumulative Year 2040 plus Project peak hour LOS at the study intersections.

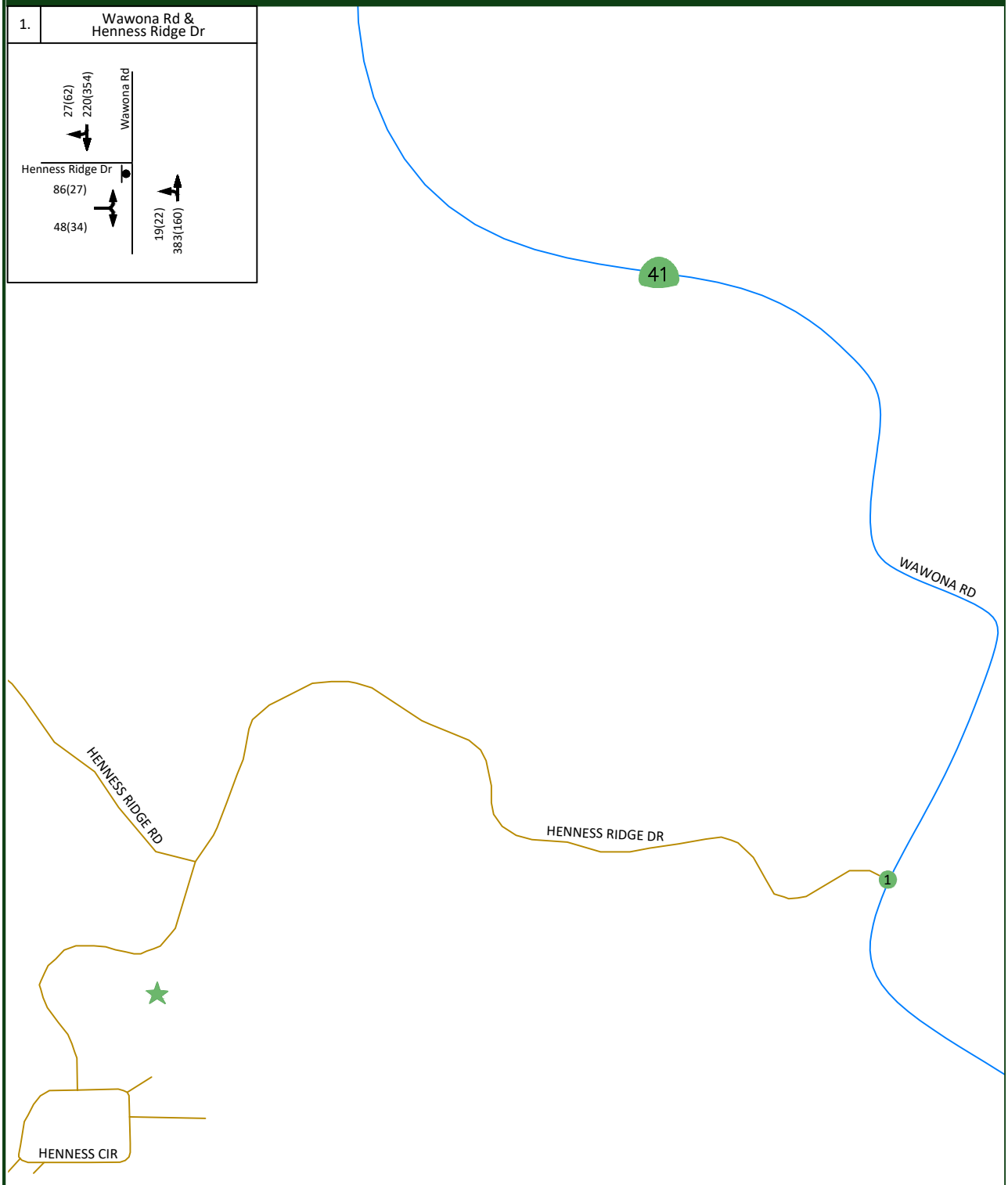
Under this scenario, the intersection of Wawona Road and Henness Ridge Drive is projected to operate at an acceptable LOS during both peak periods.

Table VIII: Cumulative Year 2040 plus Project Intersection LOS Results

ID	*Intersection*	*Intersection Control*	*AM (9 - 11) Peak Hour*		*PM (4 - 7) Peak Hour*	
			Average Delay (sec/veh)	*LOS*	*Average Delay (sec/veh)*	*LOS*
1	Wawona Road / Henness Ridge Drive	Two-Way Stop	16.3	C	13.2	B

Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls.
LOS for two-way STOP controlled intersections are based on the worst approach/movement of the minor street.

LeBlanc - County of Mariposa
Figure 10
Cumulative Year 2040 plus Project - Traffic Volumes, Geometrics and Controls



LEGEND

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N

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Queuing Analysis

Table IX provides a queue length summary for left-turn and right-turn lanes at the study intersections under all study scenarios. The queuing analyses for the study intersections are contained in the LOS worksheets for the respective scenarios. Appendix C contains the methodologies used to evaluate these intersections.

Queuing analyses were completed using Sim Traffic output information. Synchro provides both 50th and 95th percentile maximum queue lengths (in feet). According to the Synchro manual, "the 50th percentile maximum queue is the maximum back of queue on a typical cycle and the 95th percentile queue is the maximum back of queue with 95th percentile volumes." The queues shown on Table IX are the 95th percentile queue lengths for the respective lane movements.

The existing storage capacity will be sufficient to accommodate the maximum queue for the Cumulative Year 2040 plus Project Traffic Conditions scenario.

Table IX: Queuing Analysis

ID	*Intersection*	*Existing Queue Storage Length (ft.)*		*Existing*		*Existing plus Project*		*Near Term No Project*		*Near Term plus Project*		*Cumulative Year 2040 No Project*		*Cumulative Year 2040 plus Project*	
				AM	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*	*AM*	*PM*
1	Wawona Road / Henness Ridge Drive	EB Left-Right	>300	61	40	61	40	77	76	74	81	67	69	70	71
		NB Left-Through	>300	26	21	26	24	21	28	23	31	22	28	25	27
		SB Through-Right	>300	0	0	0	0	0	0	0	0	0	0	0	0

Note: * = Does not exist or is not projected to exist

Study Participants

JLB Traffic Engineering, Inc. Personnel:

Jose Luis Benavides, PE, TE	Project Manager
Matthew Arndt, EIT	Engineer I/II
Jove Alcazar, EIT	Engineer I/II
Javier Rios	Engineer I/II
Dennis Wynn	Sr. Engineering Technician
Adrian Benavides	Engineering Aide

Persons Consulted:

Steve Engfer	County of Mariposa
Gary Brown	County of Mariposa
Russell Marks	County of Mariposa
Jeff Hornacek	Yosemite Mountain Builders, Inc.

References

1. County of Mariposa, *General Plan*.
2. *Guide for the Preparation of Traffic Impact Studies*, Caltrans, dated December 2002.
3. *Trip Generation,* 10th Edition, Washington D.C., Institute of Transportation Engineers, 2017.
4. *2014 California Manual on Uniform Traffic Control Devices*, Caltrans, November 7, 2014.
5. Transportation Concept Report, State Route 41, Caltrans, District 06, dated July 2013.
6. Governor's Office of Planning and Research, *Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA*, State of California, December 2018.

Appendix A: Scope of Work

August 14, 2019

Mr. Steve Engfer
County of Mariposa
5100 Bullion Street
Mariposa, CA 95338

Via Email Only: sengfer@mariposacounty.org

Subject: ***Proposed Scope of Work for the Preparation of a Traffic Impact Analysis for the LeBlanc Project located in the County of Mariposa (JLB Project 012-003)***

Dear Mr. Engfer,

JLB Traffic Engineering, Inc. (JLB) hereby submits this Draft Scope of Work for the preparation of a Traffic Impact Analysis (TIA) for the LeBlanc (Project) located within the planning area of Yosemite West in unincorporated Mariposa County. The area of operation is located approximately 18 miles from Badger Pass and 17 miles from the Yosemite Valley floor. The Project is proposing to construct support facilities in two (2) phases to aide in the operations and maintenance of the existing Home Rural Enterprise.

The primary goals of the Project are to address the need for affordable housing for the local workforce in Yosemite West while also reorganizing and relocating some of the current operational impacts in the Yosemite West neighborhood due to vacation rental activity to this new location. The proposed development site is located on a 7.2-acre parcel (APN 006-150-003, 7548 Henness Circle, Yosemite, CA 95389) which is currently vacant and adjacent to the existing Yosemite West Condominiums used as vacation rentals. The site is located to the south of the fork of Henness Ridge Road and Henness Circle at the entrance of the Yosemite West area. The first phase of the development of the site includes the immediate construction of a primary and auxiliary residence for long term rent. A detached garage structure for storage is included in Phase I development. The second phase of development proposes 16 additional, economy apartments which will be utilized for staff. These additional staff only units would include 12 one-bedroom units and four (4) two-bedroom units. The site would be occupied by approximately 46 employees which currently work and live within the Yosemite West area. Access to the Project is proposed along three (3) access points on Henness Circle. The first driveway is a looped driveway and also provides backing distance on the subject property to allow for access to the roadway without backing out. For purposes of this TIA, the Project assumes that Phase I and Phase II are constructed together. Based on information provided to JLB, the Project will undergo a General Plan Amendment through the County of Mariposa to further classify the mix of uses proposed in Phase 2. An aerial of the Project vicinity and Project Site Plan are shown in Exhibit A and Exhibit B, respectively.

The purpose of the TIA is to evaluate the potential on-site and off-site traffic impacts, identify short-term roadway and circulation needs, determine potential mitigation measures and identify any critical traffic issues that should be addressed in the on-going planning process. To evaluate the on-site and off-site traffic impacts of the proposed Project, JLB proposes the following Scope of Work.

Scope of Work

- To arrive at the future forecast volumes, JLB proposes to utilize an average annual growth rate of 1.5 percent to expand existing traffic volumes by 21 years to arrive at the Cumulative Year 2040 traffic volumes. The average annual growth rate of 1.5 percent is based on a review of Annual Average Daily Traffic (AADT) volumes obtained from Caltrans for State Route 41 near the vicinity of the proposed Project for the last 10 years.
- JLB will obtain recent or schedule and conduct new traffic counts at the study facility(ies) as necessary. These counts will include pedestrians and vehicles.
- JLB will perform a site visit to observe existing traffic conditions, especially during the AM and PM peak hours. Existing roadway conditions including intersection geometrics and traffic controls will be verified.
- JLB will evaluate on-site circulation and provide recommendations as necessary to improve circulation to and within the Project site.
- JLB will prepare CA MUTCD Warrant 3 "Peak Hour" for unsignalized study intersections under all study scenarios.
- JLB will compare the proposed parking supply against the County of Mariposa standards.
- JLB will forecast trip distribution based on turn count information and knowledge of the existing and planned circulation network in the vicinity of the Project.
- JLB will evaluate existing and forecasted levels of service (LOS) at the study intersection(s). JLB will use HCM 6th or HCM 2000 methodologies (as appropriate) within Synchro to perform this analysis for the AM and PM peak hours. JLB will identify the causes of poor LOS.

Study Scenarios

1. Existing Traffic Conditions with needed improvements (if any);
2. Existing plus Project Traffic Conditions with proposed mitigation measures (if any);
3. Near Term Year 2024 No Project Traffic Conditions with needed improvements (if any);
4. Near Term Year 2024 plus Project Traffic Conditions with proposed mitigation measures (if any);
5. Cumulative Year 2040 No Project Traffic Conditions with needed improvements (if any); and
6. Cumulative Year 2040 plus Project Traffic Conditions with proposed mitigation measures (if any).

Weekday peak hours to be analyzed (Tuesday through Thursday only)

1. 7 - 9 AM peak hour
2. 4 - 6 PM peak hour

Study Intersections

1. Henness Ridge Drive / Wawona Drive (State Route 41)

Queuing analysis is included in the proposed Scope of Work for the study intersection(s) listed above under all study scenarios. This analysis will be utilized to recommend minimum storage lengths for left-turn and right-turn lanes at all study intersections.

Study Segments

1. none

Project Trip Generation

The trip generation rates for the proposed Project were obtained from the 10th Edition of the Trip Generation Manual published by the Institute of Transportation Engineers (ITE). Table I presents the trip generation for the proposed Project with trip generation rates for Multifamily (Low-Rise) Housing and Single-Family Detached Housing. The proposed Project is estimated to generate a maximum of 136 daily trips, 8 AM peak hour trips and 11 PM peak hour trips.

Table I: Project Trip Generation

Land Use (ITE Code)	*Size*	*Unit*	*Daily*		*AM Peak Hour*						*PM Peak Hour*					
			Rate	*Total*	*Trip Rate*	*In*	*Out*	*In*	*Out*	*Total*	*Trip Rate*	*In*	*Out*	*In*	*Out*	*Total*
						%						*%*				
MultiFamily (Low-Rise) Housing (220)	16	d.u.	7.32	117	0.46	23	77	2	5	7	0.56	63	37	6	3	9
Single-Family Detached Housing (210)	2	d.u.	9.44	19	0.74	25	75	0	1	1	0.99	63	37	1	1	2
Total Project Trips				**136**				**2**	**6**	**8**				**7**	**4**	**11**

Note: d.u. = Dwelling Units

Near Term Projects to be Included

JLB is unaware of other projects in the vicinity of the proposed Project that have the ability to impact traffic operations in the Near Term Year 2024 scenarios. However, JLB will include in the Near Term Year 2024 scenarios, near term projects provided to us by responsible agencies. These would include near term projects that the County of Mariposa has knowledge of and for which it is anticipated that said project(s) is/are projected to be whole or partially built by the near term project year 2024 and for which the County of Mariposa provides JLB with near term project details. Near term project details include project description, location, proposed land uses with breakdowns and type of residential units and amount of square footages for non-residential uses.

The above Scope of Work is based on our understanding of this Project and our experience with similar TIAs. In the absence of comments by September 4, 2019 it will be assumed that the Scope of Work is acceptable to the agency(ies) that have not submitted any comments. If you have any questions or require additional information, please contact me by phone at (559) 317-6273 or by e-mail at smaciel@JLBtraffic.com.

Sincerely,

Susana Maciel

Susana Maciel
Project Engineer

cc: Russell Marks, Mariposa County
Gary Brown, Mariposa County
Jose Benavides, JLB Traffic Engineering, Inc.

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Exhibit A – Aerial

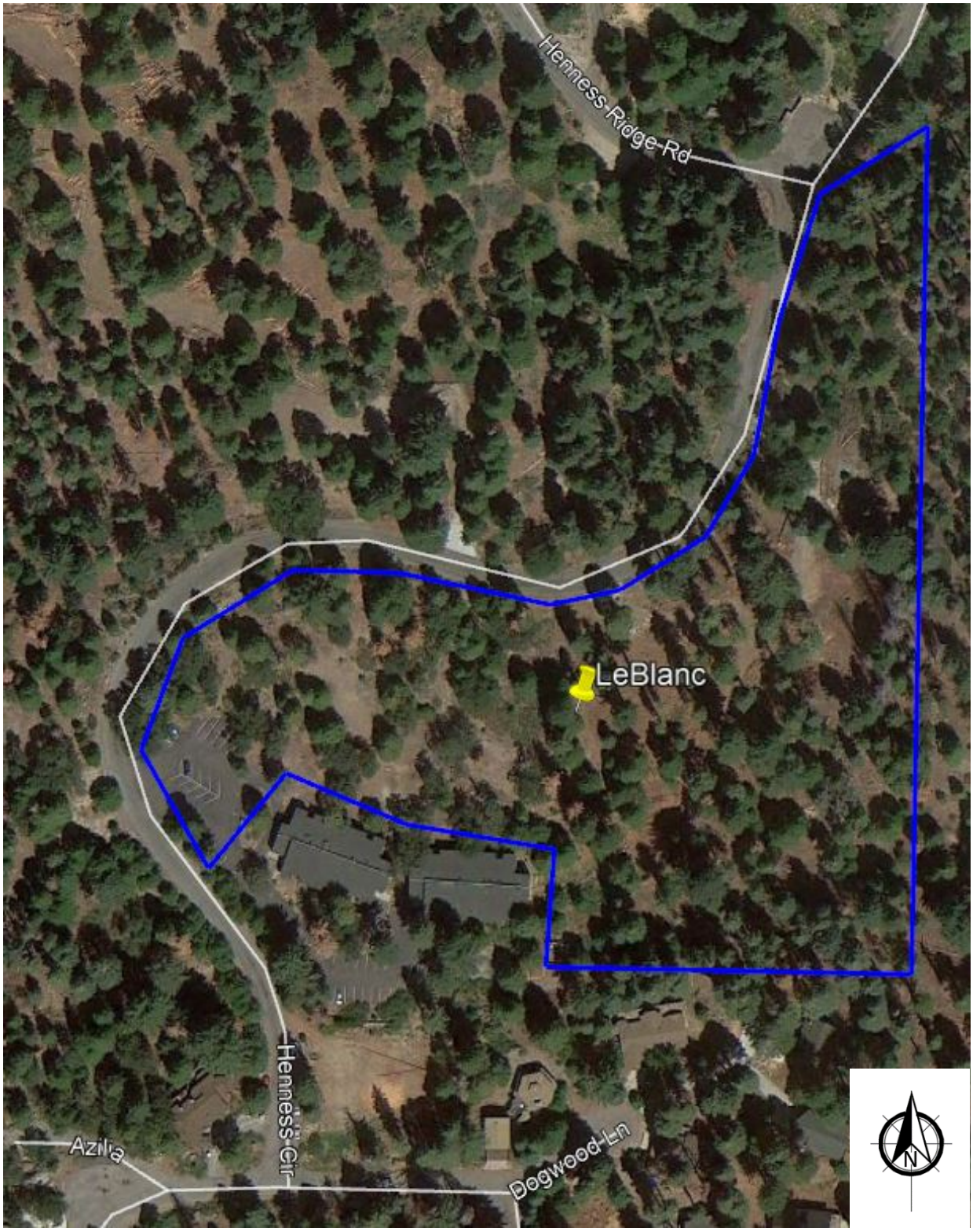
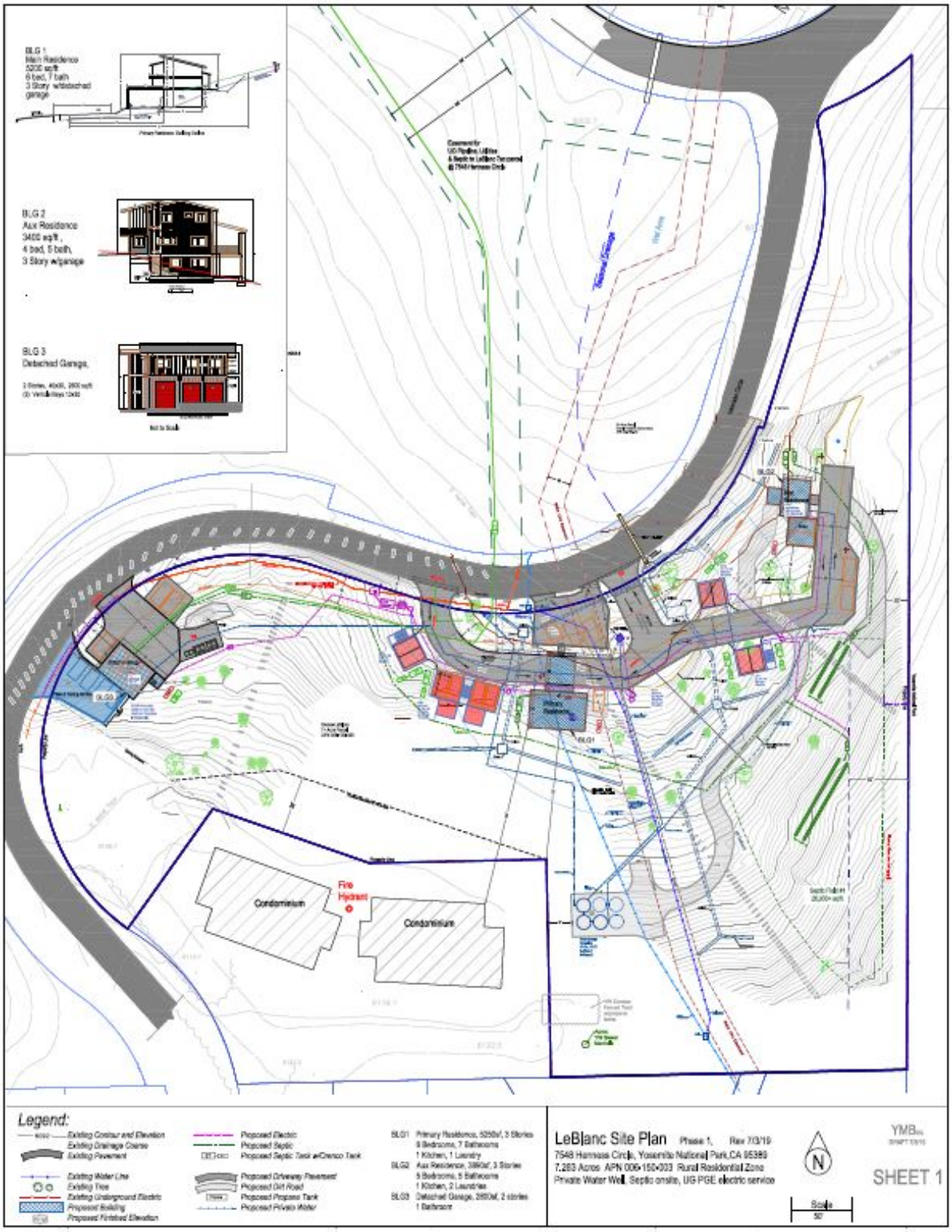


Exhibit B – Project Site Plan



~~August 14~~September 10, 2019

Mr. Steve Engfer
County of Mariposa
5100 Bullion Street
Mariposa, CA 95338

Via Email Only: sengfer@mariposacounty.org

Subject: ***Revised Proposed Scope of Work for the Preparation of a Traffic Impact Analysis for the LeBlanc Project located in the County of Mariposa (JLB Project 012-003)***

Dear Mr. Engfer,

JLB Traffic Engineering, Inc. (JLB) hereby submits this Revised Draft Scope of Work for the preparation of a Traffic Impact Analysis (TIA) for the LeBlanc (Project) located within the planning area of Yosemite West in unincorporated Mariposa County. The Draft Scope of Work has been revised to update the day and time of the peak hours to be analyzed. The area of operation is located approximately 18 miles from Badger Pass and 17 miles from the Yosemite Valley floor. The Project is proposing to construct support facilities in two (2) phases to aide in the operations and maintenance of the existing Home Rural Enterprise.

The primary goals of the Project are to address the need for affordable housing for the local workforce in Yosemite West while also reorganizing and relocating some of the current operational impacts in the Yosemite West neighborhood due to vacation rental activity to this new location. The proposed development site is located on a 7.2-acre parcel (APN 006-150-003, 7548 Henness Circle, Yosemite, CA 95389) which is currently vacant and adjacent to the existing Yosemite West Condominiums used as vacation rentals. The site is located to the south of the fork of Henness Ridge Road and Henness Circle at the entrance of the Yosemite West area. The first phase of the development of the site includes the immediate construction of a primary and auxiliary residence for long term rent. A detached garage structure for storage is included in Phase I development. The second phase of development proposes 16 additional, economy apartments which will be utilized for staff. These additional staff only units would include 12 one-bedroom units and four (4) two-bedroom units. The site would be occupied by approximately 46 employees which currently work and live within the Yosemite West area. Access to the Project is proposed along three (3) access points on Henness Circle. The first driveway is a looped driveway and also provides backing distance on the subject property to allow for access to the roadway without backing out. For purposes of this TIA, the Project assumes that Phase I and Phase II are constructed together. Based on information provided to JLB, the Project will undergo a General Plan Amendment through the County of Mariposa to further classify the mix of uses proposed in Phase 2. An aerial of the Project vicinity and Project Site Plan are shown in Exhibit A and Exhibit B, respectively.

The purpose of the TIA is to evaluate the potential on-site and off-site traffic impacts, identify short-term roadway and circulation needs, determine potential mitigation measures and identify any critical traffic issues that should be addressed in the on-going planning process. To evaluate the on-site and off-site traffic impacts of the proposed Project, JLB proposes the following Scope of Work.

Scope of Work

- To arrive at the future forecast volumes, JLB proposes to utilize an average annual growth rate of 1.5 percent to expand existing traffic volumes by 21 years to arrive at the Cumulative Year 2040 traffic volumes. The average annual growth rate of 1.5 percent is based on a review of Annual Average Daily Traffic (AADT) volumes obtained from Caltrans for State Route 41 near the vicinity of the proposed Project for the last 10 years.
- JLB will obtain recent or schedule and conduct new traffic counts at the study facility(ies) as necessary. These counts will include pedestrians and vehicles.
- JLB will perform a site visit to observe existing traffic conditions, especially during the AM and PM peak hours. Existing roadway conditions including intersection geometrics and traffic controls will be verified.
- JLB will evaluate on-site circulation and provide recommendations as necessary to improve circulation to and within the Project site.
- JLB will prepare CA MUTCD Warrant 3 "Peak Hour" for unsignalized study intersections under all study scenarios.
- JLB will compare the proposed parking supply against the County of Mariposa standards.
- JLB will forecast trip distribution based on turn count information and knowledge of the existing and planned circulation network in the vicinity of the Project.
- JLB will evaluate existing and forecasted levels of service (LOS) at the study intersection(s). JLB will use HCM 6th or HCM 2000 methodologies (as appropriate) within Synchro to perform this analysis for the AM and PM peak hours. JLB will identify the causes of poor LOS.

Study Scenarios

1. Existing Traffic Conditions with needed improvements (if any);
2. Existing plus Project Traffic Conditions with proposed mitigation measures (if any);
3. Near Term Year 2024 No Project Traffic Conditions with needed improvements (if any);
4. Near Term Year 2024 plus Project Traffic Conditions with proposed mitigation measures (if any);
5. Cumulative Year 2040 No Project Traffic Conditions with needed improvements (if any); and
6. Cumulative Year 2040 plus Project Traffic Conditions with proposed mitigation measures (if any).

Weekday Sunday peak hours to be analyzed (Tuesday through Thursday only)

On August, 20, 2019, the County of Mariposa responded to the Draft Scope of Work and requested that the TIA include seven-day counts and take into account the worst-case seasonal fluctuations. JLB was provided occupancy rate information in the Yosemite West area for Nightly Rental, Full-Time Private and Part-Time Private sites. The occupancy rates for these sites showed that the highest occupancy rates occur in the months of May and September. JLB prepared to collect seven-day counts during the Labor Day weekend from Saturday, August 31, 2019 through Friday, September 6, 2019. After thorough review of the seven-day counts, JLB was able to determine the busiest day of week and the busiest hours. The busiest days were Sunday with 741 daily trips and Saturday with 710 daily trips. The busiest periods were from predominantly from 9 AM to 11 AM and 4 PM to 78 PM. Based on these findings, JLB proposes to collect peak hour intersection turning movement counts on a Sunday from 9 AM to 11 AM and 4 PM to 7 PM.

1. 7 – 9 - 11 AM peak hour
2. 4 - 6 7 PM peak hour

Study Intersections

1. Henness Ridge Drive / Wawona Drive (State Route 41)

Queuing analysis is included in the proposed Scope of Work for the study intersection(s) listed above under all study scenarios. This analysis will be utilized to recommend minimum storage lengths for left-turn and right-turn lanes at all study intersections.

Study Segments

1. none

Project Trip Generation

The trip generation rates for the proposed Project were obtained from the 10th Edition of the Trip Generation Manual published by the Institute of Transportation Engineers (ITE). Table I presents the trip generation for the proposed Project with trip generation rates for Multifamily (Low-Rise) Housing and Single-Family Detached Housing. The proposed Project is estimated to generate a maximum of 136 daily trips, 8 AM peak hour trips and 11 PM peak hour trips.

Table I: Project Trip Generation

Land Use (ITE Code)	*Size*	*Unit*	*Daily*		*AM Peak Hour*						*PM Peak Hour*					
			Rate	*Total*	*Trip Rate*	*In*	*Out*	*In*	*Out*	*Total*	*Trip Rate*	*In*	*Out*	*In*	*Out*	*Total*
						%						*%*				
MultiFamily (Low-Rise) Housing (220)	16	d.u.	7.32	117	0.46	23	77	2	5	7	0.56	63	37	6	3	9
Single-Family Detached Housing (210)	2	d.u.	9.44	19	0.74	25	75	0	1	1	0.99	63	37	1	1	2
Total Project Trips				**136**				**2**	**6**	**8**				**7**	**4**	**11**

Note: d.u. = Dwelling Units

Near Term Projects to be Included

JLB is unaware of other projects in the vicinity of the proposed Project that have the ability to impact traffic operations in the Near Term Year 2024 scenarios. However, JLB will include in the Near Term Year 2024 scenarios, near term projects provided to us by responsible agencies. These would include near term projects that the County of Mariposa has knowledge of and for which it is anticipated that said project(s) is/are projected to be whole or partially built by the near term project year 2024 and for which the County of Mariposa provides JLB with near term project details. Near term project details include project description, location, proposed land uses with breakdowns and type of residential units and amount of square footages for non-residential uses.

The above Scope of Work is based on our understanding of this Project and our experience with similar TIAs. In the absence of comments by September 417, 2019 it will be assumed that the Scope of Work is acceptable to the agency(ies) that have not submitted any comments. If you have any questions or require additional information, please contact me by phone at (559) 317-6273 or by e-mail at smaciel@JLBtraffic.com.

Sincerely,

Susana Maciel

Susana Maciel
Project Engineer

cc: Russell Marks, Mariposa County
Gary Brown, Mariposa County
Jose Benavides, JLB Traffic Engineering, Inc.

JLB TRAFFIC ENGINEERING, INC.
www.JLBtraffic.com
info@JLBtraffic.com
516 W. Shaw Ave., Ste. 103
Fresno, CA 93704
(559) 570-8991

Exhibit A – Aerial

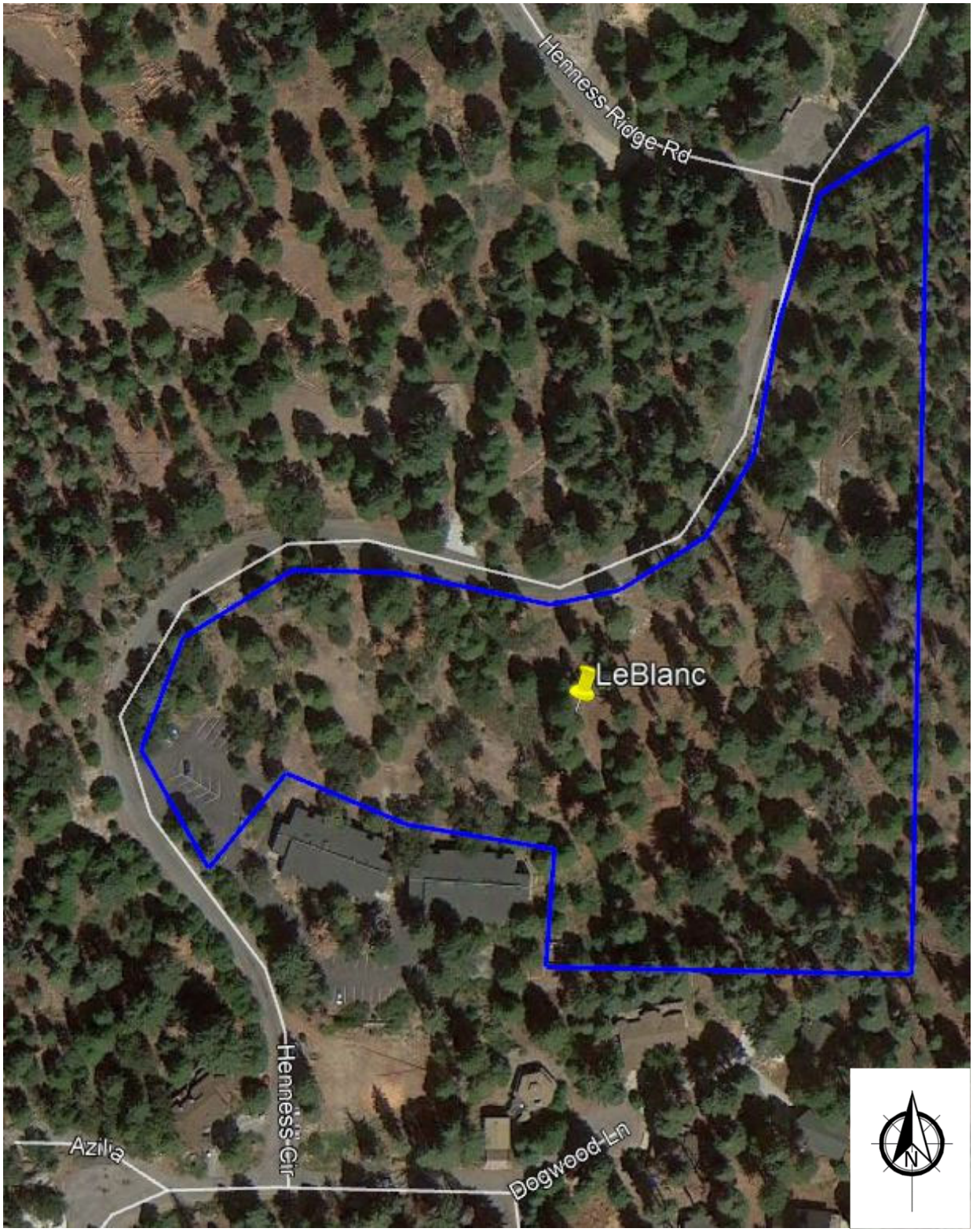
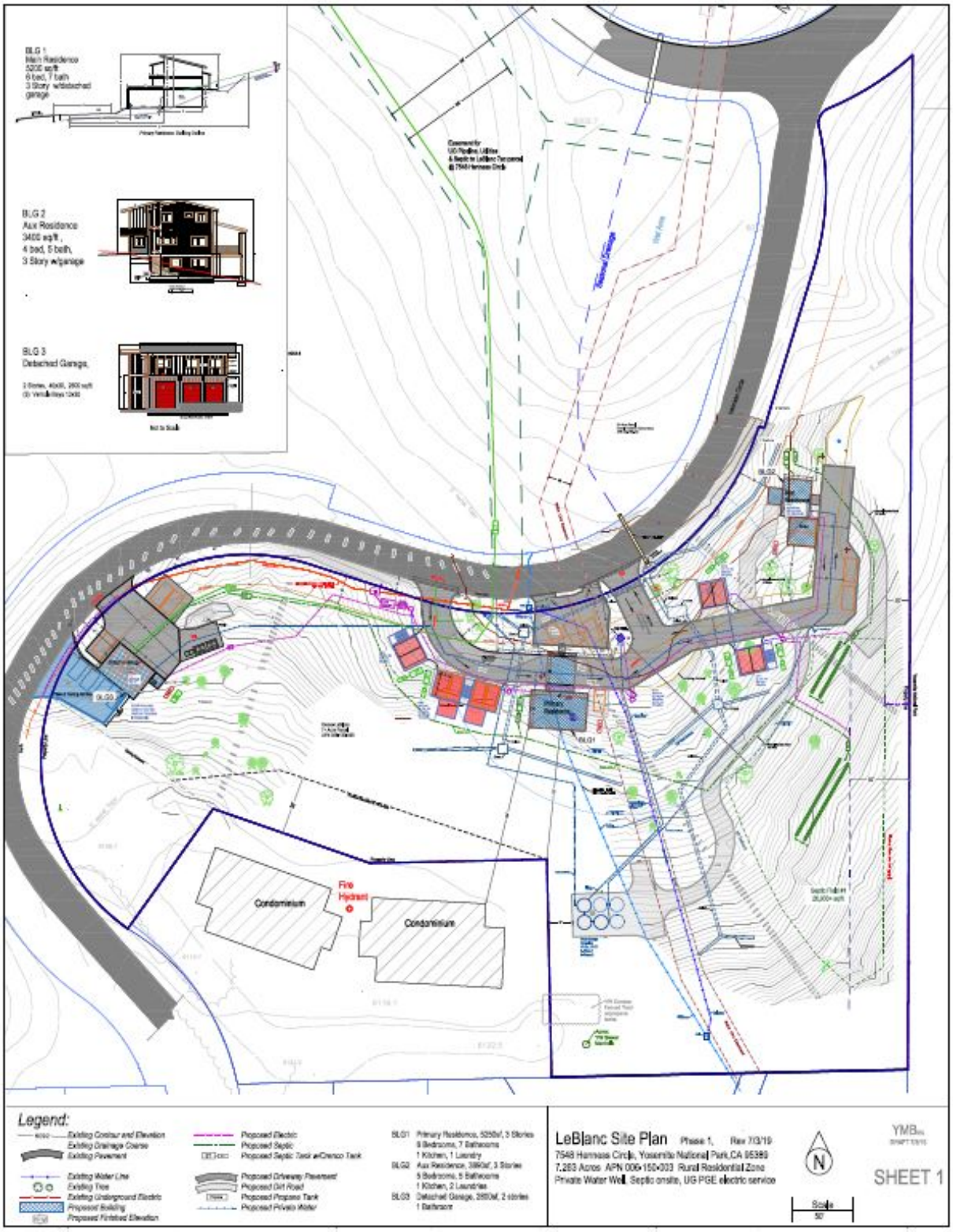


Exhibit B – Project Site Plan



Susana Maciel

From: Steve Engfer <sengfer@mariposacounty.org>
Sent: Tuesday, August 20, 2019 11:11 AM
To: Susana Maciel
Cc: Russell Marks; Gary Brown; Jose Benavides
Subject: RE: LeBlanc TIA: Draft Scope of Work
Attachments: RE: LeBlanc Project (Yosemite West)

Hello,

Gary Brown, County Engineer provided the following input on your draft scope.

"Steve, I reviewed the Proposed/Draft Scope of Work and do believe the project is defined adequately to provide input.

The project definitely has the potential to negatively impact the vehicular accessibility along Henness Circle and beyond. The current proposal shows a limited scope of Tuesday through Thursday. I would like to see the scope enhanced to include 7 days of the week. Additionally, traffic patterns in the Yosemite Area are highly subject to the seasons. The traffic study should include data that includes the worst case seasonal fluctuations. Also, the injection of ingress and egress at this critical area of the existing community suggests that there could be greater impact during winter snow conditions. Local frontage street widening should be reviewed to mitigate this potential. My suggestion is that the traffic model should include traffic count data across weeks and seasons, and not just on one selected week. Furthermore, the traffic study should review limiting access to the site to one way in both ingress and egress, and alternatively creating just one entrance/exit to Henness Circle."

MARIPOSA COUNTY
Dept. of Public Works - Engineering
Gary Brown
County Engineer"

I also attached the previous email for you with the Pre Application review comments, NPS/YNP comments are included in that packet.

Thank you.

Steve Engfer
Senior Planner, Mariposa Planning
P.O. Box 2039 • 5100 Bullion Street Mariposa CA • 95338
(209) 742-1250 • Fax (209) 742-5024
sengfer@mariposacounty.org

www.mariposacounty.org/planning

From: Susana Maciel [mailto:smaciel@jlbtraffic.com]
Sent: Wednesday, August 14, 2019 4:04 PM
To: Steve Engfer
Cc: Russell Marks; Gary Brown; Jose Benavides
Subject: LeBlanc TIA: Draft Scope of Work

Good afternoon Steve,

Attached is a Draft Scope of Work for the preparation of a Traffic Impact Analysis for a Project located in the planning area of Yosemite West in unincorporated Mariposa County. I kindly ask that you take a moment to review and comment on the proposed Scope of Work. In the absence of comments by September 4, 2019 it will be assumed that the Scope of Work is acceptable.

If you have any questions or require any additional information, please feel welcome to contact me by phone at 559.317.6273 or by email at smaciel@jlbtraffic.com.

I sincerely appreciate your time and look forward to hearing from you soon. Enjoy your day!

Best,

Susana Maciel, EIT
Project Engineer

JLB TRAFFIC ENGINEERING, INC.

Traffic Engineering, Transportation Planning and Parking Solutions
Certified Disadvantaged Business Enterprise (DBE) and Small Business Enterprise (SBE)

516 W. Shaw Ave., Ste. 103
Fresno, CA 93704
Direct: (559) 317-6273
Office: (559) 570-8991
Cell: (559) 232-9474
www.JLBtraffic.com

Susana Maciel

From: Susana Maciel
Sent: Wednesday, September 18, 2019 4:32 PM
To: Gary Brown; Steve Engfer
Cc: Russell Marks; Jose Benavides
Subject: RE: LeBlanc TIA: Draft Scope of Work

Will do, Gary. Thanks so much for your response.

Have a great day!

Best,

Susana Maciel, EIT
Project Engineer

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Fresno, CA 93704
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Office: (559) 570-8991
Cell: (559) 232-9474
www.JLBtraffic.com

From: Gary Brown <gbrown@mariposacounty.org>
Sent: Wednesday, September 18, 2019 4:27 PM
To: Susana Maciel <smaciel@jlbtraffic.com>; Steve Engfer <sengfer@mariposacounty.org>
Cc: Russell Marks <rmarks@mariposacounty.org>; Jose Benavides <jbenavides@jlbtraffic.com>
Subject: RE: LeBlanc TIA: Draft Scope of Work

Hi Susana, per our conversation your team has utilized the Labor Day week/weekend for this seasons traffic count. For your upcoming task of capturing the various movements of traffic from Highway 41 to/from Henness Ridge it is appropriate to include the same traffic counting location as before - so that we can compare the new results to the previous results.

Let me know if you have any questions.

MARIPOSA COUNTY
Dept. of Public Works - Engineering
Gary Brown
County Engineer

From: Susana Maciel <smaciel@jlbtraffic.com>
Sent: Wednesday, September 18, 2019 9:07 AM
To: Steve Engfer <sengfer@mariposacounty.org>
Cc: Russell Marks <rmarks@mariposacounty.org>; Gary Brown <gbrown@mariposacounty.org>; Jose Benavides <jbenavides@jlbtraffic.com>
Subject: RE: LeBlanc TIA: Draft Scope of Work

Of course. I have also tried phoning Mr. Gary Brown, but the calls just don't seem to get through.

Gary, please let us know if you have any concerns with the Revised Draft Scope of Work. Thanks in advance!

Best,

Susana Maciel, EIT
Project Engineer

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From: Steve Engfer <sengfer@mariposacounty.org>
Sent: Wednesday, September 18, 2019 8:56 AM
To: Susana Maciel <smaciel@jlbtraffic.com>
Cc: Russell Marks <rmarks@mariposacounty.org>; Gary Brown <gbrown@mariposacounty.org>; Jose Benavides <jbenavides@jlbtraffic.com>
Subject: RE: LeBlanc TIA: Draft Scope of Work

Hello,

I do not have an issue with the scope however, I have to defer to Public Works on the scope of the traffic study.

Have you addressed their input already in the scope?

Upon notification by the County Engineer I can move my approval forward.

Thank you.

Steve Engfer

Senior Planner, Mariposa Planning
P.O. Box 2039 • 5100 Bullion Street Mariposa CA • 95338
(209) 742-1250 • Fax (209) 742-5024
sengfer@mariposacounty.org

www.mariposacounty.org/planning

From: Susana Maciel [mailto:smaciel@jlbtraffic.com]
Sent: Wednesday, September 18, 2019 8:38 AM
To: Steve Engfer
Cc: Russell Marks; Gary Brown; Jose Benavides
Subject: RE: LeBlanc TIA: Draft Scope of Work

Good morning Steve,

I hope this email finds you well. I have tried your phone several times now without any success.

Can you please confirm that the County accepts the Revised Draft Scope of Work as presented?

I look forward to hearing from you soon.

Best,

Susana Maciel, EIT
Project Engineer

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Direct: (559) 317-6273
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www.JLBtraffic.com

From: Susana Maciel
Sent: Tuesday, September 10, 2019 3:45 PM
To: sengfer (sengfer@mariposacounty.org) <sengfer@mariposacounty.org>
Cc: rmarks@mariposacounty.org; gbrown@mariposacounty.org; Jose Benavides (jbenavides@jlbtraffic.com) <jbenavides@jlbtraffic.com>
Subject: RE: LeBlanc TIA: Draft Scope of Work

Good afternoon Steve,

Attached is a Revised Draft Scope of Work for the preparation of a TIA for the LeBlanc Project. The Draft Scope of Work has been revised to update the proposed day and time of the peak hours to be analyzed. This was based on the comments received from the County on August 20, 2019.

Please take a moment to review the Revised Draft Scope of Work and provide us with any questions, comments or concerns by September 17, 2019. Feel welcome to contact me if you need any additional information.

Enjoy your day!

Best,

Susana Maciel, EIT
Project Engineer

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From: Susana Maciel
Sent: Wednesday, August 14, 2019 4:04 PM
To: sengfer (sengfer@mariposacounty.org) <sengfer@mariposacounty.org>
Cc: rmarks@mariposacounty.org; gbrown@mariposacounty.org; Jose Benavides (jbenavides@jlbtraffic.com) <jbenavides@jlbtraffic.com>
Subject: LeBlanc TIA: Draft Scope of Work

Good afternoon Steve,

Attached is a Draft Scope of Work for the preparation of a Traffic Impact Analysis for a Project located in the planning area of Yosemite West in unincorporated Mariposa County. I kindly ask that you take a moment to review and comment on the proposed Scope of Work. In the absence of comments by September 4, 2019 it will be assumed that the Scope of Work is acceptable.

If you have any questions or require any additional information, please feel welcome to contact me by phone at 559.317.6273 or by email at smaciel@jlbtraffic.com.

I sincerely appreciate your time and look forward to hearing from you soon. Enjoy your day!

Best,

Susana Maciel, EIT
Project Engineer



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Direct: (559) 317-6273
Office: (559) 570-8991
Cell: (559) 232-9474
www.JLBtraffic.com

Appendix B: Traffic Counts

Metro Traffic Data Inc.

Metro Traffic Data Inc.
310 N. Irwin Street - Suite 20
Hanford, CA 93230

800-975-6938 Phone/Fax
www.metrotrafficdata.com

Report Prepared For:

JLB Traffic Engineering, Inc.
1300 E. Shaw Ave, Suite 103
Fresno, CA

7 Day Volume Count Report

Location No. 1

Road Name Hennessy Ridge Dr

Nearest Cross St. West of Wiseana Rd

Survey Date 8/30/19 thru 9/5/19

Latitude 37.64818°

Longitude -119.793535°

Peak Day Sunday

Number of Lanes 2

Comments

Friday, August 30, 2019

	Eastbound					Westbound					Hourly
Hour	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total	Totals
12:00 AM	0	0	0	0	0	0	0	0	0	0	0
1:00 AM	0	0	0	0	0	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0	0	0	0	0	0
6:00 AM	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0
7:00 PM	0	0	0	0	0	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0	0	0	0	0	0
Total					0					0	0

AM Peak Hr 10:45 am to 11:45 am — AM Peak 55 — AM PHF 0.694
PM Peak Hr 4:00 pm to 7:00 pm — PM Peak 63 — PM PHF 0.750

Saturday, August 31, 2019

	Eastbound					Westbound					Hourly
Hour	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total	Totals
12:00 AM	0	0	0	0	0	2	7	4	1	14	14
1:00 AM	0	0	0	1	1	1	1	1	1	4	5
2:00 AM	1	0	0	0	1	0	0	0	0	0	1
3:00 AM	0	0	0	0	0	1	0	0	0	1	1
4:00 AM	0	0	0	0	0	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0	0	0	0	0	0
6:00 AM	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0
7:00 PM	0	0	0	0	0	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0	0	0	0	0	0
Total					0					0	0

AM Peak Hr 9:30 am to 10:30 am — AM Peak 66 — AM PHF 0.786
PM Peak Hr 6:15 pm to 7:15 pm — PM Peak 67 — PM PHF 0.766

Sunday, September 01, 2019

	Eastbound					Westbound					Hourly
Hour	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total	Totals
12:00 AM	0	0	1	0	1	0	0	0	0	0	1
1:00 AM	0	0	0	0	0	1	3	1	0	5	5
2:00 AM	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	0	1	0	1	0	1	0	0	1	2
4:00 AM	0	0	0	0	0	0	0	0	0	0	0
5:00 AM	2	4	1	1	8	0	0	0	1	1	9
6:00 AM	2	1	1	0	4	0	0	0	0	0	4
7:00 AM	7	9	10	11	36	1	0	0	5	6	42
8:00 AM	3	3	4	10	20	1	0	0	3	4	24
9:00 AM	16	11	14	15	56	3	2	1	0	6	62
10:00 AM	16	16	16	10	58	2	1	0	1	4	62
11:00 AM	17	13	9	4	43	1	5	5	3	14	57
12:00 PM	7	5	6	6	24	4	3	3	1	11	35
1:00 PM	3	2	5	6	16	4	10	1	0	15	31
2:00 PM	3	3	3	5	14	4	7	5	8	24	38
3:00 PM	7	5	5	6	23	7	7	7	7	28	51
4:00 PM	7	5	5	6	23	11	6	11	8	36	59
5:00 PM	4	3	2	2	11	6	4	3	4	17	28
6:00 PM	1	2	2	0	5	3	3	2	2	10	15
7:00 PM	2	2	0	2	6	1	2	2	0	5	11
8:00 PM	0	2	0	0	2	2	0	0	0	2	4
9:00 PM	0	0	0	0	0	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0	0	0	0	0	0
Total					360					341	701

AM Peak Hr 9:45 am to 9:45 am — AM Peak 66 — AM PHF 0.660
PM Peak Hr 4:30 pm to 5:30 pm — PM Peak 63 — PM PHF 0.716

Monday, September 02, 2019

	Eastbound					Westbound					Hourly
Hour	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total	Totals
12:00 AM	0	0	0	0	0	0	0	0	1	1	1
1:00 AM	0	0	0	0	0	0	1	0	1	2	2
2:00 AM	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	0	1	0	1	0	1	0	0	1	2
4:00 AM	0	0	0	0	0	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0	0	0	0	0	0
6:00 AM	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	24	18	20	16	78	3	2	0	0	5	83
10:00 AM	16	14	11	14	55	1	1	1	0	3	58
11:00 AM	11	13	9	4	37	1	1	2	1	5	42
12:00 PM	7	5	5	4	21	2	0	3	1	6	27
1:00 PM	5	1	5	1	12	2	3	4	1	10	22
2:00 PM	4	2	4	4	14	3	1	1	1	6	20
3:00 PM	4	2	2	1	9	3	3	2	0	8	17
4:00 PM	7	5	5	6	23	1	1	1	0	3	26
5:00 PM	2	5	2	2	11	5	3	5	3	16	27
6:00 PM	2	2	0	0	4	1	0	0	0	1	5
7:00 PM	0	0	0	0	0	0	0	0	0	0	0
8:00 PM	1	3	3	1	8	7	11	5	4	27	35
9:00 PM	0	0	0	0	0	1	1	0	0	2	2
10:00 PM	0	0	0	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0	0	0	0	0	0
Total					304					125	429

AM Peak Hr 9:00 am to 10:00 am — AM Peak 83 — AM PHF 0.841
PM Peak Hr 6:45 pm to 7:45 pm — PM Peak 27 — PM PHF 0.935

Tuesday, September 03, 2019

	Eastbound					Westbound					Hourly
Hour	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total	Totals
12:00 AM	0	0	0	0	0	1	0	0	0	1	1
1:00 AM	0	0	0	0	0	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	1	1	0	1	3	3
4:00 AM	0	0	0	0	0	0	0	0	0	0	0
5:00 AM	2	1	1	1	5	0	0	0	0	0	5
6:00 AM	2	4	5	3	14	1	0	0	0	1	15
7:00 AM	5	5	5	5	20	0	0	0	0	0	20
8:00 AM	6	10	10	11	37	2	1	1	1	5	42
9:00 AM	6	8	11	9	34	2	0	0	1	3	37
10:00 AM	11	11	10	10	42	3	0	1	0	4	46
11:00 AM	9	11	12	8	40	1	2	2	2	7	47
12:00 PM	7	4	5	7	23	2	3	1	1	7	30
1:00 PM	1	4	2	7	14	4	2	4	3	13	27
2:00 PM	3	3	3	3	12	2	3	3	4	12	24
3:00 PM	6	5	6	5	22	1	0	0	0	1	23
4:00 PM	6	8	7	6	27	2	1	2	1	6	33
5:00 PM	0	3	4	3	10	6	0	3	5	14	24
6:00 PM	0	3	1	3	7	3	2	1	2	8	15
7:00 PM	0	3	1	0	4	0	4	1	0	5	9
8:00 PM	0	1	1	1	3	2	1	2	0	5	8
9:00 PM	0	1	0	2	3	2	0	0	1	3	6
10:00 PM	0	0	0	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	1	1	0	0	2	2
Total					296					110	406

AM Peak Hr 9:45 am to 10:45 am — AM Peak 61 — AM PHF 0.847
PM Peak Hr 4:45 pm to 5:45 pm — PM Peak 61 — PM PHF 0.635

Wednesday, September 04, 2019

	Eastbound					Westbound					Hourly
Hour	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total	Totals
12:00 AM	0	0	0	0	0	0	0	0	1	1	1
1:00 AM	0	0	0	0	0	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0	0	0	0	0	0
4:00 AM	0	0	0	1	1	0	0	0	0	0	1
5:00 AM	0	0	0	0	0	0	0	0	0	0	0
6:00 AM	0	1	0	0	1	0	0	0	0	0	1
7:00 AM	0	1	2	0	3	0	0	0	0	0	3
8:00 AM	2	3	5	5	15	1	0	0	0	1	16
9:00 AM	5	5	5	2	17	1	0	0	0	1	18
10:00 AM	9	11	12	8	40	3	1	2	2	8	48
11:00 AM	8	11	7	7	33	1	2	2	1	6	39
12:00 PM	3	2	4	4	13	2	1	2	1	6	19
1:00 PM	3	3	2	5	13	2	1	1	1	5	18
2:00 PM	3	3	3	3	12	2	3	2	2	9	21
3:00 PM	3	4	7	5	19	6	0	3	3	12	31
4:00 PM	4	4	2	5	15	4	2	2	1	9	24
5:00 PM	4	3	2	1	10	2	2	2	2	8	18
6:00 PM	2	2	0	2	6	2	2	0	0	4	10
7:00 PM	0	3	2	1	6	7	7	11	10	35	41
8:00 PM	1	1	1	0	3	0	0	1	2	3	6
9:00 PM	0	0	0	0	0	4	0	0	1	5	5
10:00 PM	0	0	0	0	0	2	2	0	0	4	4
11:00 PM	0	0	0	0	0	0	0	0	0	0	0
Total					224					124	348

AM Peak Hr 8:30 am to 9:30 am — AM Peak 66 — AM PHF 0.868
PM Peak Hr 5:45 pm to 6:45 pm — PM Peak 56 — PM PHF 0.824

Thursday, September 05, 2019

	Eastbound					Westbound					Hourly
Hour	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total	Totals
12:00 AM	0	0	0	0	0	0	1	0	0	1	1
1:00 AM	0	0	0	0	0	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0	1	0	0	1	1
3:00 AM	0	0	0	0	0	0	0	0	0	0	0
4:00 AM	0	0	0	1	1	0	0	0	0	0	1
5:00 AM	0	0	0	0	0	0	0	0	0	0	0
6:00 AM	0	0	0	0	0	0	1	0	1	2	2
7:00 AM	0	1	0	0	1	0	0	0	0	0	1
8:00 AM	0	0	1	0	1	0	0	0	0	0	1
9:00 AM	10	10	12	9	41	0	1	0	0	1	42
10:00 AM	13	13	7	13	46	3	1	5	3	12	58
11:00 AM	5	7	5	4	21	1	2	1	0	4	25
12:00 PM	3	3	2	3	11	1	2	1	3	7	18
1:00 PM	3	3	2	2	10	1	2	1	0	4	14
2:00 PM	3	3	2	3	11	1	2	4	0	7	18
3:00 PM	3	5	4	3	15	0	4	4	0	8	23
4:00 PM	5	4	3	4	16	1	1	0	0	2	18
5:00 PM	3	2	7	3	15	9	4	6	8	27	42
6:00 PM	2	3	2	3	10	2	3	4	3	12	22
7:00 PM	2	1	2	0	5	7	5	14	9	35	40
8:00 PM	1	2	2	2	7	2	4	2	4	12	19
9:00 PM	1	1	0	0	2	4	2	4	2	12	14
10:00 PM	0	0	0	0	0	1	0	0	0	1	1
11:00 PM	0	0	0	0	0	0	0	0	0	0	0
Total					232					161	393

AM Peak Hr 9:15 am to 10:15 am — AM Peak 59 — AM PHF 0.615
PM Peak Hr 4:00 pm to 5:00 pm — PM Peak 52 — PM PHF 0.813

Metro Traffic Data Inc.
310 N. Irwin Street - Suite 20
Hanford, CA 93230

800-975-6938 Phone/Fax
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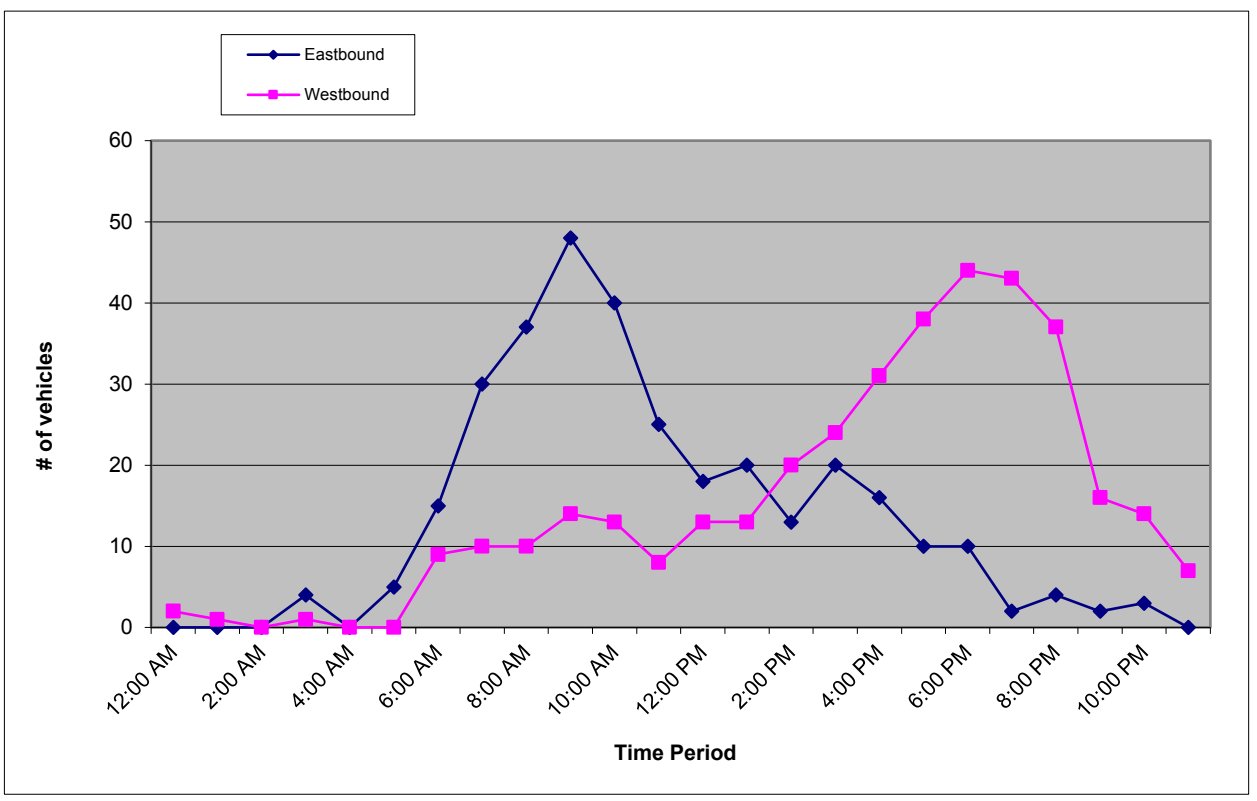
24 Hour Volume Report

Prepared For: **JLB Traffic Engineering, Inc.**
1300 E. Shaw Ave, Suite 103
Fresno, CA

LOCATION Henness Ridge Dr w/o Wawona Rd
LATITUDE 37.648118°
COUNTY Fresno
LONGITUDE -119.703535°
COLLECTION DATE Friday, September 06, 2019
WEATHER Clear
NUMBER OF LANES 2

	Eastbound					Westbound					Hourly
Hour	:00	:15	:30	:45	Total	:00	:15	:30	:45	Total	Totals
12:00 AM	0	0	0	0	**0**	1	0	0	1	**2**	**2**
1:00 AM	0	0	0	0	**0**	0	0	1	0	**1**	**1**
2:00 AM	0	0	0	0	**0**	0	0	0	0	**0**	**0**
3:00 AM	2	0	1	1	**4**	0	1	0	0	**1**	**5**
4:00 AM	0	0	0	0	**0**	0	0	0	0	**0**	**0**
5:00 AM	0	3	0	2	**5**	0	0	0	0	**0**	**5**
6:00 AM	3	6	3	3	**15**	0	2	6	1	**9**	**24**
7:00 AM	4	8	6	12	**30**	0	4	3	3	**10**	**40**
8:00 AM	2	11	9	15	**37**	2	3	3	2	**10**	**47**
9:00 AM	13	13	10	12	**48**	5	3	2	4	**14**	**62**
10:00 AM	16	8	7	9	**40**	3	4	4	2	**13**	**53**
11:00 AM	3	12	3	7	**25**	2	5	1	0	**8**	**33**
12:00 PM	6	2	6	4	**18**	2	5	1	5	**13**	**31**
1:00 PM	1	6	5	8	**20**	1	3	3	6	**13**	**33**
2:00 PM	5	3	1	4	**13**	5	6	5	4	**20**	**33**
3:00 PM	3	5	3	9	**20**	11	4	4	5	**24**	**44**
4:00 PM	2	5	2	7	**16**	7	8	9	7	**31**	**47**
5:00 PM	1	2	3	4	**10**	7	11	12	8	**38**	**48**
6:00 PM	0	2	4	4	**10**	16	10	16	2	**44**	**54**
7:00 PM	2	0	0	0	**2**	6	11	13	13	**43**	**45**
8:00 PM	2	0	2	0	**4**	20	7	5	5	**37**	**41**
9:00 PM	0	2	0	0	**2**	4	6	5	1	**16**	**18**
10:00 PM	3	0	0	0	**3**	3	6	2	3	**14**	**17**
11:00 PM	0	0	0	0	**0**	5	1	0	1	**7**	**7**
Total	**46.7%**				**322**	**53.3%**				**368**	
	690										

AM%	**39.4%**	**AM Peak**	**63**	**9:15 am to 10:15 am**	**AM P.H.F.**	**0.83**
PM%	**60.6%**	**PM Peak**	**60**	**5:45 pm to 6:45 pm**	**PM P.H.F.**	**0.75**



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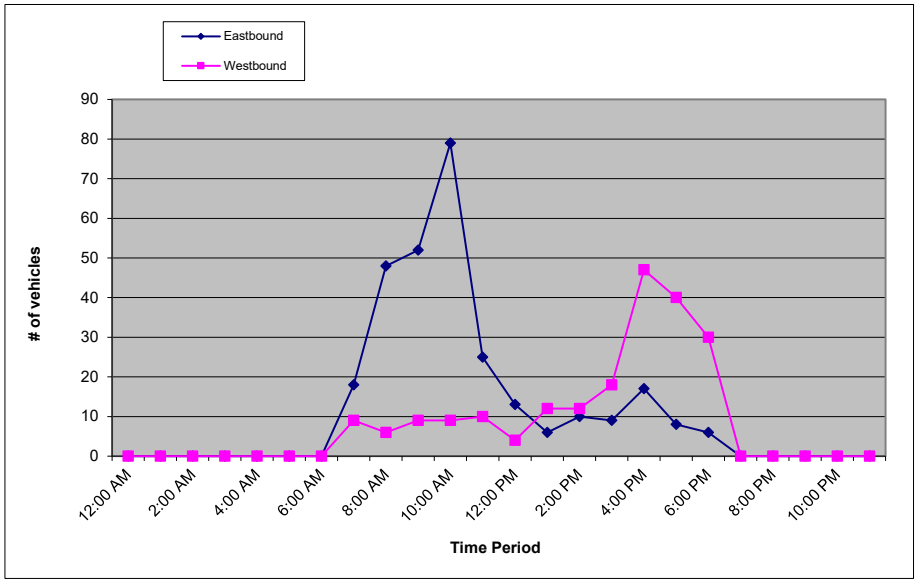
24 Hour Volume Report

Prepared For: **JLB Traffic Engineering, Inc.**
1300 E. Shaw Ave, Suite 103
Fresno, CA

LOCATION Henness Ridge Dr w/o Wawona Rd
LATITUDE 37.648118°
COUNTY Mariposa
LONGITUDE -119.703535°
COLLECTION DATE Sunday, September 29, 2019
WEATHER Clear
NUMBER OF LANES 2

	Eastbound					Westbound					Hourly
Hour	:00	:15	:30	:45	**Total**	:00	:15	:30	:45	**Total**	**Totals**
12:00 AM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
1:00 AM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
2:00 AM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
3:00 AM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
4:00 AM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
5:00 AM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
6:00 AM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
7:00 AM	-	8	3	7	**18**	-	4	2	3	**9**	**27**
8:00 AM	6	10	12	20	**48**	1	5	0	0	**6**	**54**
9:00 AM	11	10	12	19	**52**	4	0	4	1	**9**	**61**
10:00 AM	24	22	15	18	**79**	0	5	1	3	**9**	**88**
11:00 AM	10	11	1	3	**25**	3	2	2	3	**10**	**35**
12:00 PM	3	6	2	2	**13**	1	1	0	2	**4**	**17**
1:00 PM	3	1	1	1	**6**	5	1	3	3	**12**	**18**
2:00 PM	0	3	2	5	**10**	1	3	5	3	**12**	**22**
3:00 PM	2	4	2	1	**9**	3	4	7	4	**18**	**27**
4:00 PM	2	4	2	9	**17**	6	14	13	14	**47**	**64**
5:00 PM	2	1	3	2	**8**	8	10	11	11	**40**	**48**
6:00 PM	2	0	2	2	**6**	6	10	8	6	**30**	**36**
7:00 PM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
8:00 PM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
9:00 PM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
10:00 PM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
11:00 PM	-	-	-	-	**0**	-	-	-	-	**0**	**0**
Total	**58.6%**				**291**	**41.4%**				**206**	
	497										

AM%	**53.3%**	**AM Peak**	**88**	**10:00 am to 11:00 am**	**AM P.H.F.**	**0.81**
PM%	**46.7%**	**PM Peak**	**66**	**4:15 pm to 5:15 pm**	**PM P.H.F.**	**0.72**



Metro Traffic Data Inc.
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Hanford, CA 93230

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Turning Movement Report

Prepared For:

JLB Traffic Engineering, Inc.
1300 E. Shaw Ave, Suite 103
Fresno, CA

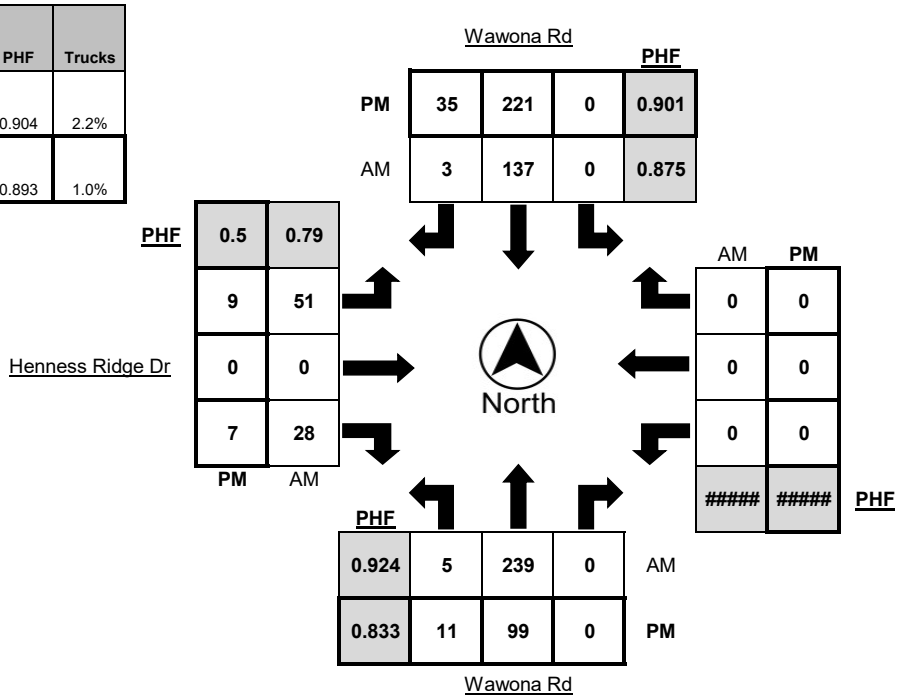
LOCATION Wawona Rd @ Henness Ridge Dr
LATITUDE 37.6482
COUNTY Mariposa
LONGITUDE -119.7026
COLLECTION DATE Sunday, September 29, 2019
WEATHER Clear

	Northbound				Southbound				Eastbound				Westbound			
Time	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
9:00 AM - 9:15 AM	2	47	0	0	0	25	1	0	9	0	0	0	0	0	0	0
9:15 AM - 9:30 AM	1	33	0	0	0	19	0	1	13	0	2	0	0	0	0	0
9:30 AM - 9:45 AM	4	53	0	2	0	22	0	0	4	0	6	0	0	0	0	0
9:45 AM - 10:00 AM	0	35	0	0	0	22	1	0	18	0	2	0	0	0	0	0
10:00 AM - 10:15 AM	0	61	0	1	0	38	0	1	18	0	7	0	0	0	0	0
10:15 AM - 10:30 AM	3	63	0	2	0	38	2	1	11	0	11	0	0	0	0	0
10:30 AM - 10:45 AM	1	60	0	1	0	28	0	2	7	0	8	1	0	0	0	0
10:45 AM - 11:00 AM	1	55	0	1	0	33	1	0	15	0	2	0	0	0	0	0
TOTAL	**12**	**407**	**0**	**7**	**0**	**225**	**5**	**5**	**95**	**0**	**38**	**1**	**0**	**0**	**0**	**0**

	Northbound				Southbound				Eastbound				Westbound			
Time	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
4:00 PM - 4:15 PM	4	25	0	0	0	56	2	0	2	0	0	0	0	0	0	0
4:15 PM - 4:30 PM	1	16	0	0	0	58	12	0	0	0	3	0	0	0	0	0
4:30 PM - 4:45 PM	2	31	0	1	0	59	12	3	3	0	0	0	0	0	0	0
4:45 PM - 5:00 PM	4	27	0	0	0	48	9	0	4	0	4	0	0	0	0	0
5:00 PM - 5:15 PM	4	19	0	1	0	55	8	0	1	0	1	0	0	0	0	0
5:15 PM - 5:30 PM	2	17	0	0	0	43	7	0	1	0	0	0	0	0	0	0
5:30 PM - 5:45 PM	4	19	0	0	0	55	7	0	3	0	0	0	0	0	0	0
5:45 PM - 6:00 PM	2	12	0	0	0	46	7	0	1	0	1	0	0	0	0	0
6:00 PM - 6:15 PM	1	19	0	0	0	45	4	0	2	0	0	0	0	0	0	0
6:15 PM - 6:30 PM	0	14	0	0	0	38	9	0	0	0	0	0	0	0	0	0
6:30 PM - 6:45 PM	1	10	0	0	0	21	7	0	1	0	1	0	0	0	0	0
6:45 PM - 7:00 PM	1	11	0	1	0	32	4	0	2	0	0	0	0	0	0	0
TOTAL	**26**	**220**	**0**	**3**	**0**	**556**	**88**	**3**	**20**	**0**	**10**	**0**	**0**	**0**	**0**	**0**

	Northbound				Southbound				Eastbound				Westbound			
PEAK HOUR	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
10:00 AM - 11:00 AM	5	239	0	5	0	137	3	4	51	0	28	1	0	0	0	0
4:00 PM - 5:00 PM	11	99	0	1	0	221	35	3	9	0	7	0	0	0	0	0

	PHF	Trucks
AM	0.904	2.2%
PM	0.893	1.0%



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Turning Movement Report

Prepared For:

JLB Traffic Engineering, Inc.
1300 E. Shaw Ave, Suite 103
Fresno, CA

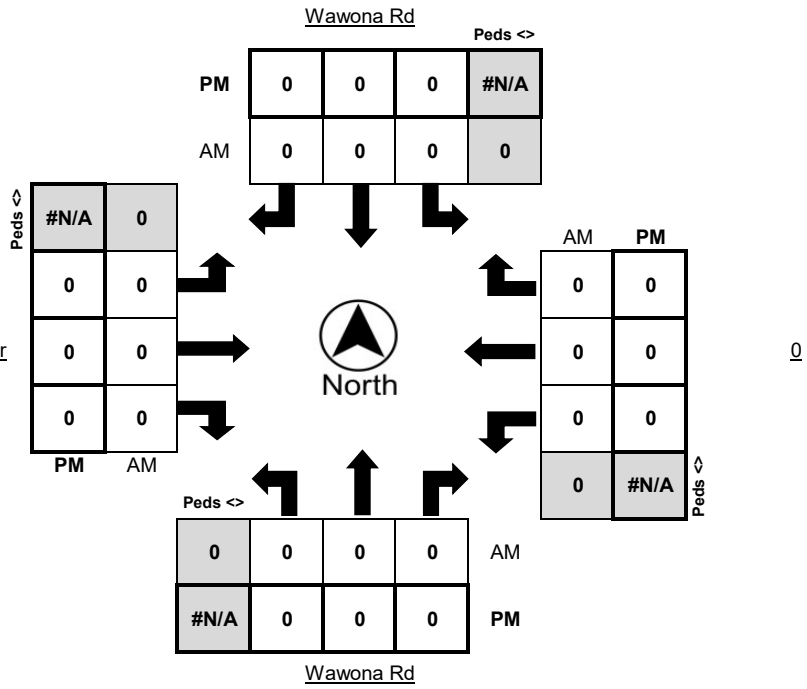
LOCATION Wawona Rd @ Henness Ridge Dr
LATITUDE 37.6482
COUNTY Mariposa
LONGITUDE -119.7026
COLLECTION DATE Sunday, September 29, 2019
WEATHER Clear

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
9:00 AM - 9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM - 9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM - 9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM - 10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM - 10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM - 10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM - 10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM - 11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
4:00 PM - 4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM - 4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM - 4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM - 6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM - 6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM - 6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM - 7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
PEAK HOUR	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
10:00 AM - 11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM - 5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Bikes	Peds
AM Peak Total	0	0
PM Peak Total	**0**	**0**



Appendix C: Methodology

Levels of Service Methodology

The description and procedures for calculating capacity and level of service (LOS) are found in the Transportation Research Board, Highway Capacity Manual (HCM). The HCM 6th Edition represents the research on capacity and quality of service for transportation facilities.

Quality of service requires quantitative measures to characterize operational conditions within a traffic stream. Level of service is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience.

Six levels of service are defined for each type of facility that has analysis procedures available. Letters designate each level of service (LOS), from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions and the driver's perception of these conditions. Safety is not included in the measures that establish an LOS.

Intersection Levels of Service

One of the more important elements limiting and often interrupting the flow of traffic on a highway is the intersection. Flow on an interrupted facility is usually dominated by points of fixed operation such as traffic signals, stop signs and yield signs.

Signalized Intersections – Performance Measures

For signalized intersections, the performance measures include automobile volume-to-capacity ratio, automobile delay, queue storage length, ratio of pedestrian delay, pedestrian circulation area, pedestrian perception score, bicycle delay and bicycle perception score. LOS is also considered a performance measure. For the automobile mode, the average control delay per vehicle per approach is determined for the peak hour. A weighted average of control delay per vehicle is then determined for the intersection. An LOS designation is given to the weighted average control delay to better describe the level of operation. A description of LOS for signalized intersections is found in Table A-1.

Table A-1: Signalized Intersection Levels of Service Description (Automobile Mode)

Level of Service	*Description*	*Average Control Delay (Seconds per Vehicle)*
A	Operations with a control delay of 10 seconds/vehicle or less and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is really low and either progression is exceptionally favorable or the cycle length is very short. If it's due to favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.	≤10
B	Operations with control delay between 10.1 to 20.0 seconds/vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.	>10.0 to 20.0
C	Operations with average control delays between 20.1 to 35.0 seconds/vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio no greater than 1.0, the progression is favorable or the cycle length is moderate. Individual cycle failures (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.	>20 to 35
D	Operations with control delay between 35.1 to 55.0 seconds/vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.	>35 to 55
E	Operations with control delay between 55.1 to 80.0 seconds/vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable and the cycle length is long. Individual cycle failures are frequent.	>55 to 80
F	Operations with unacceptable control delay exceeding 80.0 seconds/vehicle and a volume-to-capacity ratio greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor and the cycle length is long. Most cycles fail to clear the queue.	>80

Note: Source: Highway Capacity Manual 6th Edition

Unsignalized Intersections

The HCM 6th Edition procedures use control delay as a measure of effectiveness to determine level of service. Delay is a measure of driver discomfort, frustration, fuel consumption and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, traffic and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions, i.e., in the absence of traffic control, geometric delay, any incidents and any other vehicles. Control delay is the increased time of travel for a vehicle approaching and passing through an unsignalized intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection.

All-Way Stop Controlled Intersections

All-way stop controlled intersections are a form of traffic controls in which all approaches to an intersection are required to stop. Similar to signalized intersections, at all-way stop controlled intersections the average control delay per vehicle per approach is determined for the peak hour. A weighted average of control delay per vehicle is then determined for the intersection as a whole. In other words, the delay measured for all-way stop controlled intersections is a measure of the average delay for all vehicles passing through the intersection during the peak hour. An LOS designation is given to the weighted average control delay to better describe the level of operation.

Two-Way Stop Controlled Intersections

Two-way stop controlled (TWSC) intersections in which stop signs are used to assign the right-of-way, are the most prevalent type of intersection in the United States. At TWSC intersections the stop-controlled approaches are referred to as the minor street approaches and can be either public streets or private driveways. The approaches that are not controlled by stop signs are referred to as the major street approaches.

The capacity of movements subject to delay are determined using the "critical gap" method of capacity analysis. Expected average control delay based on movement volume and movement capacity is calculated. An LOS for a TWSC intersection is determined by the computed or measured control delay for each minor movement. LOS is not defined for the intersection as a whole for three main reasons: (a) major-street through vehicles are assumed to experience zero delay; (b) the disproportionate number of major-street through vehicles at the typical TWSC intersection skews the weighted average of all movements, resulting in a very low overall average delay from all vehicles; and (c) the resulting low delay can mask important LOS deficiencies for minor movements. Table A-2 provides a description of LOS at unsignalized intersections.

Table A-2: Unsignalized Intersection Levels of Service Description (Automobile Mode)

Control Delay (Seconds per Vehicle)	***LOS by Volume-to-Capacity Ratio***	
	v/c ≤ 1.0	***v/c > 1.0***
≤10	A	F
>10 to 15	B	F
>15 to 25	C	F
>25 to 35	D	F
>35 to 50	E	F
>50	F	F

Note: Source: HCM 6th Edition, Exhibit 20-2.

Roundabout Controlled Intersections

Roundabouts are intersections with a generally circular shape, characterized by yield on entry and circulation around a central island. Roundabouts have been used successfully throughout the world and are being used increasingly in the United States, especially since 1990. The procedure used to calculate LOS incorporates a combination of lane-based regression models and gap acceptance models for both single-lane and multi-lane roundabouts. As a result, the capacity models focus on one entry of a roundabout at a time. Table A-3 provides a description of LOS at roundabout intersections.

Table A-3: Roundabout Intersection Level of Service Description (Automobile Mode)

Control Delay (Seconds per Vehicle)	***LOS by Volume-to-Capacity Ratio***	
	v/c ≤ 1.0	***v/c > 1.0***
≤10	A	F
>10 to 15	B	F
>15 to 25	C	F
>25 to 35	D	F
>35 to 50	E	F
>50	F	F

Note: Source: HCM 6th Edition, Exhibit 22-8.

Segment Levels of Service

Segments are portions of roads without any interruption of flow. These are typically studied as urban streets, basic freeways, multilane highways or two-lane highways. Each of these categories has further classification and the level of service analysis can differ between them.

Basic Freeway and Multilane Highway Segments

For segments of multilane highways and basic freeways outside the influence of merging, diverging and weaving maneuvers, LOS is defined by density. Density describes a motorist's proximity to other vehicles and is related to a motorist's freedom to maneuver within the traffic stream. Chapter 12 of the Highway Capacity Manual categorizes each LOS as follows:

LOS A describes free-flow operations. FFS prevails on the freeway or multilane highway, and vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. The effects of incidents or point breakdowns are easily absorbed.

LOS B represents reasonably free-flow operations, and FFS on the freeway or multilane highway is maintained. The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. The effects of minor incidents are still easily absorbed.

LOS C provides for flow with speeds near the FFS of the freeway or multilane highway. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver. Minor incidents may still be absorbed, but the local deterioration in service quality will be significant. Queues may be expected to form behind any significant blockages.

LOS D is the level at which speeds begin to decline with increasing flows, with density increasing more quickly. Freedom to maneuver within the traffic stream is seriously limited, and drivers experience reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing, because the traffic stream has little space to absorb disruptions.

LOS E describes operation at or near capacity. Operations on the freeway or multilane highway at this level are highly volatile because there are virtually no usable gaps within the traffic stream, leaving little room to maneuver within the traffic stream. Any disruption to the traffic stream, such as vehicles entering from a ramp or an access point or a vehicle changing lanes, can establish a disruption wave that propagates throughout the upstream traffic stream. Toward the upper boundary of LOS E, the traffic stream has no ability to dissipate even the most minor disruption, and any incident can be expected to produce a serious breakdown and substantial queuing. The physical and psychological comfort afforded to drivers is poor.

LOS F describes unstable flow. Such conditions exist within queues forming behind bottlenecks. Breakdowns occur for a number of reasons:

- Traffic incidents can temporarily reduce the capacity of a short segment so that the number of vehicles arriving at a point is greater than the number of vehicles that can move through it.
- Points of recurring congestion, such as merge or weaving segments and lane drops, experience very high demand in which the number of vehicles arriving is greater than the number of vehicles that can be discharged.
- In analyses using forecast volumes, the projected flow rate can exceed the estimated capacity of a given location.

Basic Freeway

Basic Freeway segments generally have four to eight lanes and posted speed limits between 50 and 75 mi/hr. The performance measures include capacity, free flow speed, demand and volume-to-capacity ratio, space mean speed, average density and LOS. The LOS is dependent on the number of lanes, base free-flow speed, lane width, right side lateral clearance, total ramp density, hourly demand volume, peak hour factor and total truck percentage. Table A-4 provides a description of LOS for Basic Freeway Segments.

Multilane Highway

Multilane Highway segments generally have four to six lanes and posted speed limits between 40 and 55 mi/hr. The performance measures include capacity, free flow speed, demand and volume-to-capacity ratio, space mean speed, average density and LOS. The LOS is dependent on the number of lanes, base free-flow speed, lane width, right side lateral clearance, left side lateral clearance, access point density, terrain type, median type, hourly demand volume, peak hour factor and total truck percentage. Table A-4 provides a description of LOS for Multilane Highway Segments.

Table A-4: Basic Freeway and Multilane Highway Segment Level of Service Description

Level of Service	*Density (Passenger Cars per Mile per Lane)*
A	≤11
B	>11 to 18
C	>18 to 26
D	>26 to 35
E	>35 to 45
F	>45 or Demand Exceeds Capacity

Note: Source: HCM 6th Edition, Exhibit 12-15.

Two-Lane Highway Segments

Two-Lane Highways generally have one lane per direction and only allow passing maneuvers to take place in the opposing lane of traffic. If allowed, passing maneuvers are limited by the availability of gaps in the opposing traffic stream and by the availability of sufficient sight distance for a driver to discern the approach of an opposing vehicle safely. A principal measure of LOS is percent time spent following and follower density. This is the average percent of time that vehicles must travel in platoons behind slower vehicles due to the inability to pass. Chapter 15 of the Highway Capacity Manual categorizes each LOS as follows:

At **LOS A**, motorists experience high operating speeds on Class I highways and little difficulty in passing. Platoons of three or more vehicles are rare. On Class II highways, speed is controlled primarily by roadway conditions, but a small amount of platooning would be expected. On Class III highways, motorists can maintain operating speeds at or near the facility's FFS.

At **LOS B**, passing demand and passing capacity are balanced. On both Class I and Class II highways, the degree of platooning becomes noticeable. Some speed reductions are present on Class I highways. On Class III highways, maintenance of FFS operation becomes difficult, but the speed reduction is still relatively small.

At **LOS C**, most vehicles travel in platoons. Speeds are noticeably curtailed on all three classes of highways.

At **LOS D**, platooning increases significantly. Passing demand is high on both Class I and Class II facilities, but passing capacity approaches zero. A high percentage of vehicles travels in platoons, and PTSF is noticeable. On Class III highways, the fall-off from FFS is significant.

At **LOS E**, demand is approaching capacity. Passing on Class I and II highways is virtually impossible, and PTSF is more than 80%. Speeds are seriously curtailed. On Class III highways, speed is less than two-thirds of the FFS. The lower limit of LOSE represents capacity.

LOS F exists whenever demand flow in one or both directions exceeds the segment's capacity. Operating conditions are unstable and heavy congestion exists on all classes of two-lane highways.

Two-Lane Highway

The performance measures include average travel speed, segment travel time, percent followers, volume to capacity ratio, follower density and LOS. The LOS is dependent on Highway Class (I, II, or III), lane width, shoulder width, access point density, terrain type, free flow speed, passing lane length, demand flow rate, opposing demand flow rate peak hour factor and total truck percentage. Tables A-5 and A-6 provide a description of LOS for Two-Lane Highway Segments.

Table A-5: Two-Lane Highway Segment Level of Service Description

LOS	*Class I Highways*		*Class II Highways*	*Class III Highways*
	ATS (Mile per Hour)	*PTSF (%)*	*PTSF (%)*	*PFFS (%)*
A	>55	≤35	≤40	>91.7
B	>50 to 55	>35 to 50	>40 to 55	>83.3 to 91.7
C	>45 to 50	>50 to 65	>55 to 70	>75.0 to 83.3
D	>40 to 45	>65 to 80	>70 to 85	>66.7 to 75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: ATS = Average Travel Speed
PTSF = Percent Time Spent Following
PFFS = Percent of Free Flow Speed
Source: HCM 6th Edition, Exhibit 15-3.

Table A-6: Two-Lane Highway Segment Level of Service Description

LOS	*Follower Density (Followers per Mile per Lane)*	
	High Speed Highways Posted Speed Limit ≥ 50 miles per hour	*High Speed Highways Posted Speed Limit < 50 miles per hour*
A	≤2.0	≤2.0
B	>2.0 to 4.0	>2.5 to 5.0
C	>4.0 to 8.0	>5.0 to 10.0
D	>8.0 to 12.0	>10.0 to 15.0
E	>12.0	>15.0

Note: Source: NCHRP 'Improved Analysis of Two-Lane Highway Capacity and Operational Performance, Table 3-23.

Urban Streets (Automobile Mode)

The term "urban streets" refers to urban arterials and collectors, including those in downtown areas. Arterial streets are roads that primarily serve longer through trips. However, providing access to abutting commercial and residential land uses is also an important function of arterials. Collector streets provide both land access and traffic circulation within residential, commercial and industrial areas. Their access function is more important than that of arterials and unlike arterials their operation is not always dominated by traffic signals. Downtown streets are signalized facilities that often resemble arterials.

They not only move through traffic but also provide access to local businesses for passenger cars, transit buses and trucks. Pedestrian conflicts and lane obstructions created by stopping or standing taxicabs, buses, trucks and parking vehicles that cause turbulence in the traffic flow are typical of downtown streets.

Flow Characteristics

The speed of vehicles on urban streets is influenced by three main factors, street environment, interaction among vehicles and traffic control.

The street environment includes the geometric characteristics of the facility, the character of roadside activity and adjacent land uses. Thus, the environment reflects the number and width of lanes, type of median, driveway/access point density, spacing between signalized intersections, existence of parking, level of pedestrian and bicyclist activity and speed limit.

The interaction among vehicles is determined by traffic density, the proportion of trucks and buses and turning movements. This interaction affects the operation of vehicles at intersections and, to a lesser extent, between signals.

Traffic controls (including signals and signs) force a portion of all vehicles to slow or stop. The delays and speed changes caused by traffic control devices reduce vehicle speeds; however, such controls are needed to establish right-of-way.

Urban Street Segments LOS

The average travel speed for through vehicles along an urban street is the determinant of the operating level of service (LOS). The travel speed along a segment, section or entire length of an urban street is dependent on the running speed between signalized intersections and the amount of control delay incurred at signalized intersections. Table A-7 provides a description of LOS for Urban Street Segments.

LOS A describes primarily free-flow operation. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at signalized intersections is minimal. Travel speeds exceed 80 percent of the base free flow speed (FFS).

LOS B describes reasonably unimpeded operation. The ability to maneuver within the traffic stream is only slightly restricted and control delay at the boundary intersections is not significant. The travel speed is between 67 and 80 percent of the base FFS.

LOS C describes stable operations. The ability to maneuver and change lanes in midblock location may be more restricted than at LOS B. Longer queues at the boundary intersections may contribute to lower travel speeds. The travel speed is between 50 and 67 percent of the base FFS.

LOS D indicates a less stable condition in which small increases in flow may cause substantial increases in delay and decreases in travel speed. This operation may be due to adverse signal progression, high volumes or inappropriate signal timing at the boundary intersections. The travel speed is between 40 and 50 percent of the base FFS.

LOS E is characterized as an unstable operation and has significant delay. Such operations may be due to some combination of adverse progression, high volume and inappropriate signal timing at the boundary intersections. The travel speed is between 30 and 40 percent of the base FFS.

LOS F is characterized by street flow at extremely low speed. Congestion is likely occurring at the boundary intersections, as indicated by high delay and extensive queuing. The travel speed is 30 percent or less of the base FFS.

Table A-7: Urban Street Levels of Service (Automobile Mode)

LOS	***Travel Speed Threshold by Base Free-Flow Speed (miles/hour)***							***Volume-to-Capacity Ratio***
	55	**50**	**45**	**40**	**35**	**30**	**25**	
A	>44	>40	>36	>32	>28	>24	>20	≤ 1.0
B	>37	>34	>30	>27	>23	>20	>17	
C	>28	>25	>23	>20	>18	>15	>13	
D	>22	>20	>18	>16	>14	>12	>10	
E	>17	>15	>14	>12	>11	>9	>8	
F	≤17	≤15	≤14	≤12	≤11	≤9	≤8	
F	Any							> 1.0

Note: a = The Critical volume-to-capacity ratio is based on consideration of the through movement-to-capacity ratio at each boundary intersection in the subject direction of travel. The critical volume-to-capacity ratio is the largest ratio of those considered.
Source: Highway Capacity Manual 6th Edition, Exhibit 16-3.

Appendix D: Existing Traffic Conditions

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	59	33	6	276	158	4
Future Vol, veh/h	59	33	6	276	158	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	66	37	7	307	176	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	499	178	180	0	-	0
Stage 1	178	-	-	-	-	-
Stage 2	321	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	529	862	1389	-	-	-
Stage 1	850	-	-	-	-	-
Stage 2	733	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	526	862	1389	-	-	-
Mov Cap-2 Maneuver	526	-	-	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	733	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.1	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1389	-	611	-	-
HCM Lane V/C Ratio	0.005	-	0.167	-	-
HCM Control Delay (s)	7.6	0	12.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	11	9	13	115	255	41
Future Vol, veh/h	11	9	13	115	255	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	12	10	15	129	287	46

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	469	310	333	0	-	0
Stage 1	310	-	-	-	-	-
Stage 2	159	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	551	728	1221	-	-	-
Stage 1	741	-	-	-	-	-
Stage 2	867	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	544	728	1221	-	-	-
Mov Cap-2 Maneuver	544	-	-	-	-	-
Stage 1	731	-	-	-	-	-
Stage 2	867	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.1	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1221	-	614	-	-
HCM Lane V/C Ratio	0.012	-	0.037	-	-
HCM Control Delay (s)	8	0	11.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	79	72
Average Queue (ft)	37	3
95th Queue (ft)	61	26
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	55	31
Average Queue (ft)	13	4
95th Queue (ft)	40	21
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Appendix E: Existing plus Project Traffic Conditions

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	63	35	7	276	158	5
Future Vol, veh/h	63	35	7	276	158	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	70	39	8	307	176	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	502	179	182	0	-	0
Stage 1	179	-	-	-	-	-
Stage 2	323	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	527	861	1387	-	-	-
Stage 1	850	-	-	-	-	-
Stage 2	732	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	523	861	1387	-	-	-
Mov Cap-2 Maneuver	523	-	-	-	-	-
Stage 1	844	-	-	-	-	-
Stage 2	732	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.2	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1387	-	608	-	-
HCM Lane V/C Ratio	0.006	-	0.179	-	-
HCM Control Delay (s)	7.6	0	12.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	11	15	115	255	46
Future Vol, veh/h	13	11	15	115	255	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	15	12	17	129	287	52

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	476	313	339	0	-	0
Stage 1	313	-	-	-	-	-
Stage 2	163	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	546	725	1215	-	-	-
Stage 1	739	-	-	-	-	-
Stage 2	864	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	538	725	1215	-	-	-
Mov Cap-2 Maneuver	538	-	-	-	-	-
Stage 1	728	-	-	-	-	-
Stage 2	864	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.2	0.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1215	-	610	-	-
HCM Lane V/C Ratio	0.014	-	0.044	-	-
HCM Control Delay (s)	8	0	11.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	79	72
Average Queue (ft)	40	3
95th Queue (ft)	61	26
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	55	31
Average Queue (ft)	13	6
95th Queue (ft)	40	24
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Appendix F: Near Term No Project Traffic Conditions

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	64	42	18	276	158	26
Future Vol, veh/h	64	42	18	276	158	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	71	47	20	307	176	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	538	191	205	0	-	0
Stage 1	191	-	-	-	-	-
Stage 2	347	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	502	848	1360	-	-	-
Stage 1	839	-	-	-	-	-
Stage 2	713	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	493	848	1360	-	-	-
Mov Cap-2 Maneuver	493	-	-	-	-	-
Stage 1	824	-	-	-	-	-
Stage 2	713	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.6	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1360	-	591	-	-
HCM Lane V/C Ratio	0.015	-	0.199	-	-
HCM Control Delay (s)	7.7	0	12.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.7	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	32	20	115	255	54
Future Vol, veh/h	25	32	20	115	255	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	28	36	22	129	287	61

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	491	318	348	0	-	0
Stage 1	318	-	-	-	-	-
Stage 2	173	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	535	720	1205	-	-	-
Stage 1	735	-	-	-	-	-
Stage 2	855	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	524	720	1205	-	-	-
Mov Cap-2 Maneuver	524	-	-	-	-	-
Stage 1	720	-	-	-	-	-
Stage 2	855	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.5	1.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1205	-	619	-	-
HCM Lane V/C Ratio	0.019	-	0.103	-	-
HCM Control Delay (s)	8	0	11.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	99	54
Average Queue (ft)	41	3
95th Queue (ft)	77	21
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	111	53
Average Queue (ft)	36	6
95th Queue (ft)	76	28
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Appendix G: Near Term plus Project Traffic Conditions

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	68	44	19	276	158	27
Future Vol, veh/h	68	44	19	276	158	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	76	49	21	307	176	30

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	540	191	206	0	-	0
Stage 1	191	-	-	-	-	-
Stage 2	349	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	501	848	1359	-	-	-
Stage 1	839	-	-	-	-	-
Stage 2	712	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	491	848	1359	-	-	-
Mov Cap-2 Maneuver	491	-	-	-	-	-
Stage 1	823	-	-	-	-	-
Stage 2	712	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.8	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1359	-	588	-	-
HCM Lane V/C Ratio	0.016	-	0.212	-	-
HCM Control Delay (s)	7.7	0	12.8	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.8	-	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	27	34	22	115	255	59
Future Vol, veh/h	27	34	22	115	255	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	30	38	25	129	287	66

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	499	320	353	0	-	0
Stage 1	320	-	-	-	-	-
Stage 2	179	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	529	718	1200	-	-	-
Stage 1	734	-	-	-	-	-
Stage 2	850	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	517	718	1200	-	-	-
Mov Cap-2 Maneuver	517	-	-	-	-	-
Stage 1	718	-	-	-	-	-
Stage 2	850	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.6	1.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1200	-	613	-	-
HCM Lane V/C Ratio	0.021	-	0.112	-	-
HCM Control Delay (s)	8.1	0	11.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	99	54
Average Queue (ft)	39	4
95th Queue (ft)	74	23
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	122	53
Average Queue (ft)	39	7
95th Queue (ft)	81	31
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Appendix H: Cumulative Year 2040 No Project Traffic Conditions

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	82	46	18	383	220	26
Future Vol, veh/h	82	46	18	383	220	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	91	51	20	426	244	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	725	259	273	0	-	0
Stage 1	259	-	-	-	-	-
Stage 2	466	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	391	777	1284	-	-	-
Stage 1	782	-	-	-	-	-
Stage 2	630	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	383	777	1284	-	-	-
Mov Cap-2 Maneuver	383	-	-	-	-	-
Stage 1	766	-	-	-	-	-
Stage 2	630	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16	0.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1284	-	468	-	-
HCM Lane V/C Ratio	0.016	-	0.304	-	-
HCM Control Delay (s)	7.8	0	16	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	1.3	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	32	20	160	354	57
Future Vol, veh/h	25	32	20	160	354	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	28	36	22	180	398	64

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	654	430	462	0	-	0
Stage 1	430	-	-	-	-	-
Stage 2	224	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	430	623	1094	-	-	-
Stage 1	654	-	-	-	-	-
Stage 2	811	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	421	623	1094	-	-	-
Mov Cap-2 Maneuver	421	-	-	-	-	-
Stage 1	640	-	-	-	-	-
Stage 2	811	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13	0.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1094	-	515	-	-
HCM Lane V/C Ratio	0.021	-	0.124	-	-
HCM Control Delay (s)	8.4	0	13	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	79	52
Average Queue (ft)	43	4
95th Queue (ft)	67	22
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	111	52
Average Queue (ft)	35	6
95th Queue (ft)	69	28
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Appendix I: Cumulative Year 2040 plus Project Traffic Conditions

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	86	48	19	383	220	27
Future Vol, veh/h	86	48	19	383	220	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	96	53	21	426	244	30

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	727	259	274	0	-	0
Stage 1	259	-	-	-	-	-
Stage 2	468	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	389	777	1283	-	-	-
Stage 1	782	-	-	-	-	-
Stage 2	628	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	381	777	1283	-	-	-
Mov Cap-2 Maneuver	381	-	-	-	-	-
Stage 1	766	-	-	-	-	-
Stage 2	628	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.3	0.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1283	-	466	-	-
HCM Lane V/C Ratio	0.016	-	0.32	-	-
HCM Control Delay (s)	7.9	0	16.3	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.4	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	27	34	22	160	354	62
Future Vol, veh/h	27	34	22	160	354	62
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	30	38	25	180	398	70

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	663	433	468	0	-	0
Stage 1	433	-	-	-	-	-
Stage 2	230	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	425	621	1088	-	-	-
Stage 1	652	-	-	-	-	-
Stage 2	806	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	414	621	1088	-	-	-
Mov Cap-2 Maneuver	414	-	-	-	-	-
Stage 1	635	-	-	-	-	-
Stage 2	806	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.2	1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1088	-	508	-	-
HCM Lane V/C Ratio	0.023	-	0.135	-	-
HCM Control Delay (s)	8.4	0	13.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.5	-	-

Intersection: 1: Wawona Road & Henness Ridge Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	79	52
Average Queue (ft)	45	5
95th Queue (ft)	70	25
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 1: Wawona Road & Henness Ridge Drive

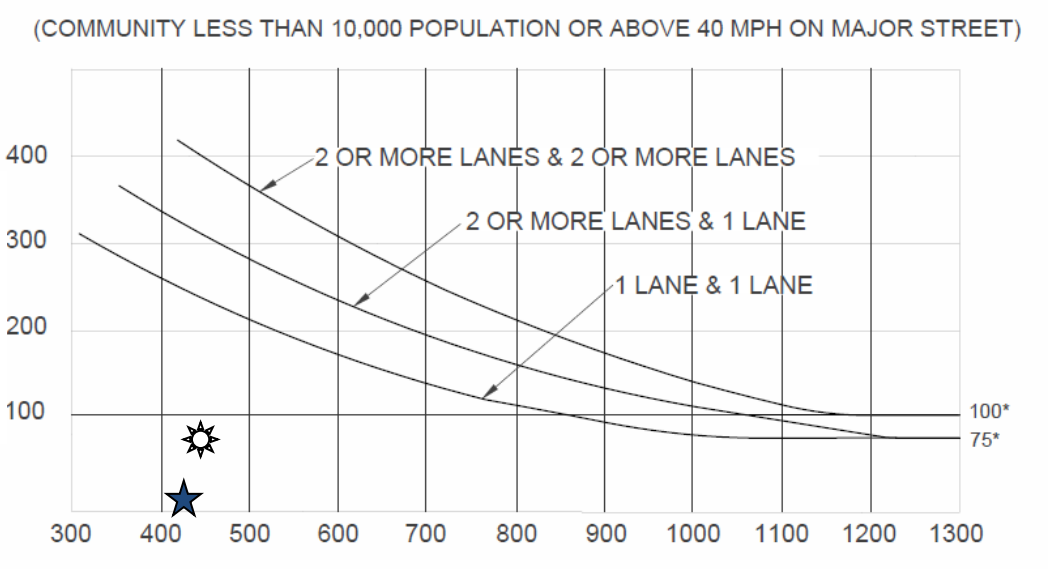
Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	111	52
Average Queue (ft)	38	6
95th Queue (ft)	71	27
Link Distance (ft)	299	470
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Appendix J: Signal Warrants

Warrant 3: Peak Hour (Rural)

Existing Traffic Conditions
1. Wawona Road / Henness Ridge Drive
AM (PM) Peak Hour

Henness Ridge Drive Highest Approach Volume = 76 (16) VPH



Wawona Road Total of Both Approaches =

444 (424) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Not Met

PM Peak Hour – Signal Warrant is Not Met

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
Part 4: Highway Traffic Signals
November 7, 2014

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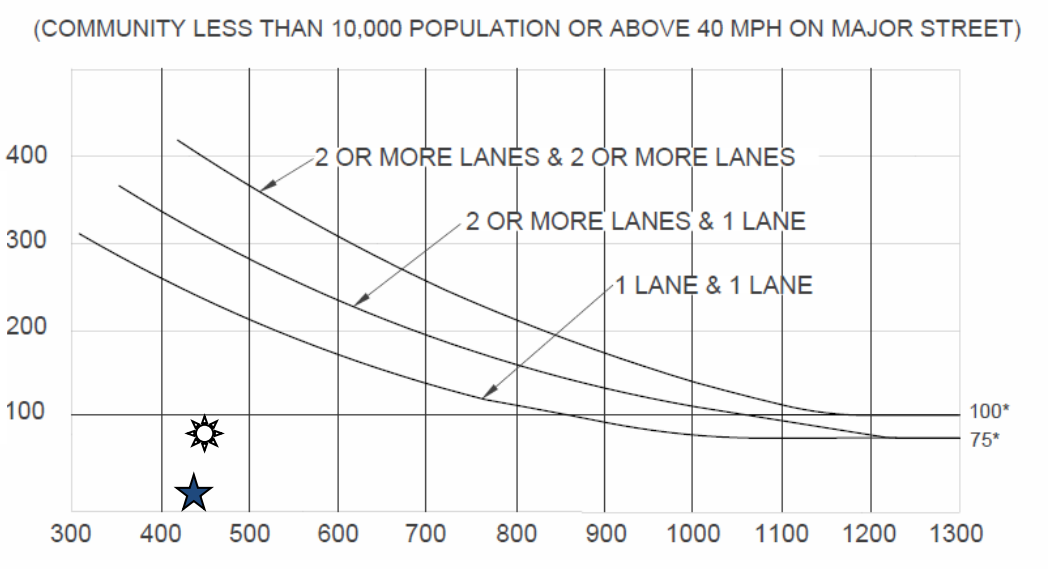
Warrant 3: Peak Hour (Rural)

Existing plus Project Traffic Conditions
1. Wawona Road / Henness Ridge Drive
AM (PM) Peak Hour

Henness Ridge Drive Highest Approach Volume = 81 (19) VPH



Wawona Road Total of Both Approaches =

446 (431) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Not Met

PM Peak Hour – Signal Warrant is Not Met

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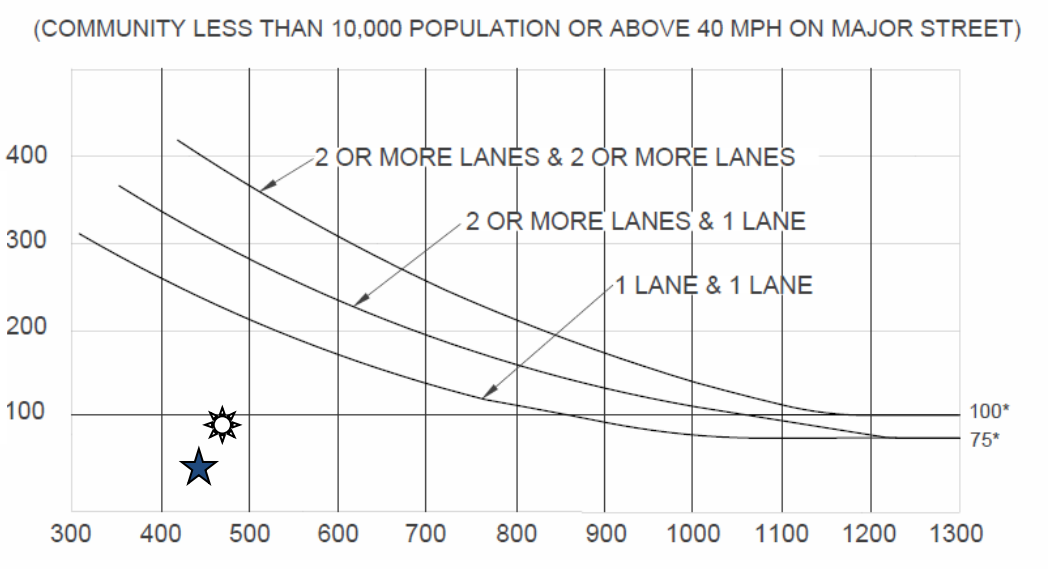
Warrant 3: Peak Hour (Rural)

Near Term No Project Traffic Conditions
1. Wawona Road / Henness Ridge Drive
AM (PM) Peak Hour

Henness Ridge Drive Highest Approach Volume = 85 (41) VPH



Wawona Road Total of Both Approaches =

478 (444) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Not Met

PM Peak Hour – Signal Warrant is Not Met

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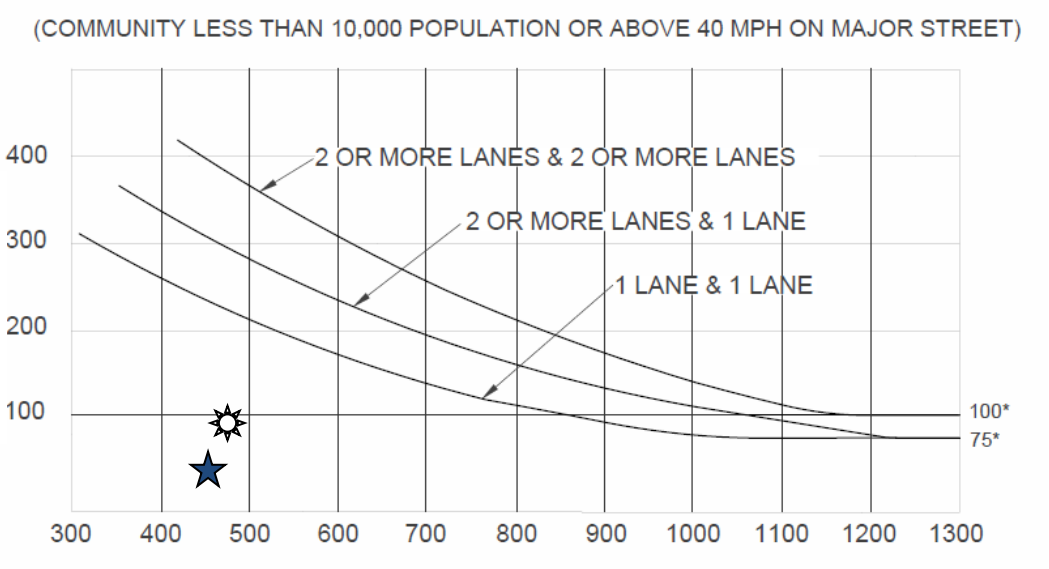
Warrant 3: Peak Hour (Rural)

Near Term plus Project Traffic Conditions
1. Wawona Road / Henness Ridge Drive
AM (PM) Peak Hour

Henness Ridge Drive Highest Approach Volume = 90 (44) VPH



Wawona Road Total of Both Approaches =

480 (451) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Not Met

PM Peak Hour – Signal Warrant is Not Met

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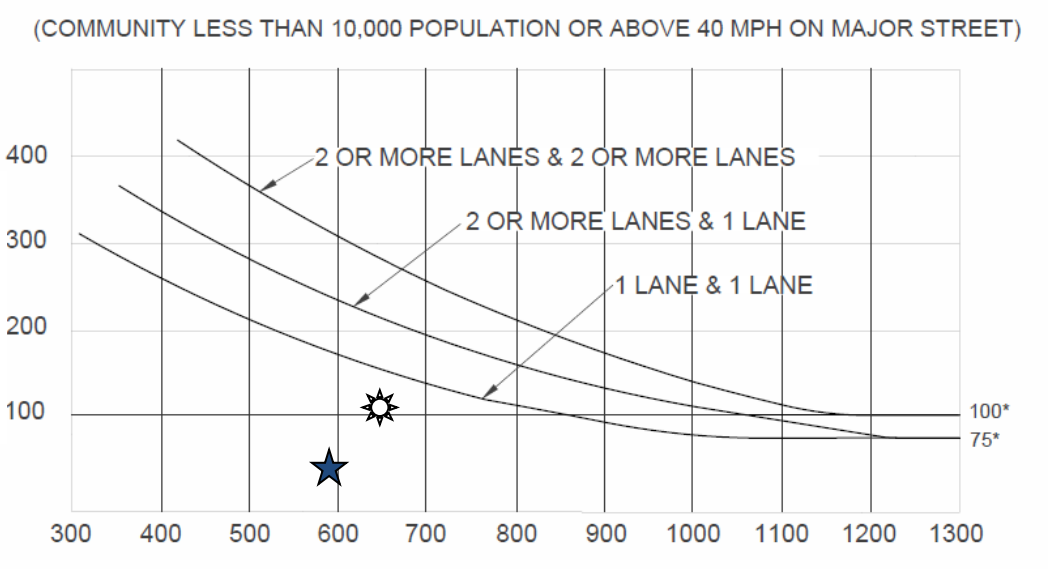
Warrant 3: Peak Hour (Rural)

Cumulative Year 2040 No Project Traffic Conditions
1. Wawona Road / Henness Ridge Drive
AM (PM) Peak Hour

Henness Ridge Drive Highest Approach Volume = 105 (41) VPH



Wawona Road Total of Both Approaches =

647 (591) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Not Met

PM Peak Hour – Signal Warrant is Not Met

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
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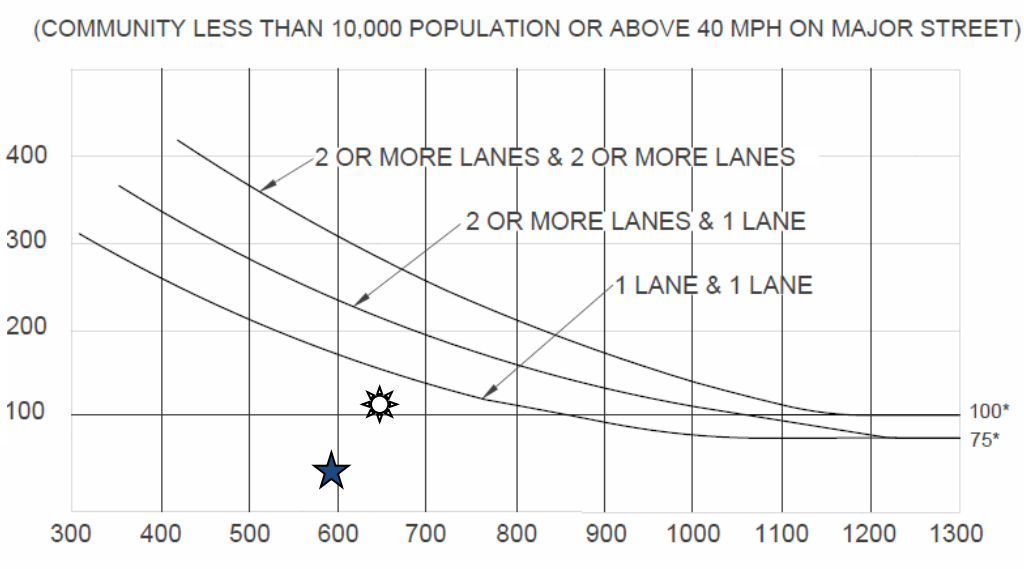
Warrant 3: Peak Hour (Rural)

Cumulative Year 2040 plus Project Traffic Conditions
1. Wawona Road / Henness Ridge Drive
AM (PM) Peak Hour

Henness Ridge Drive Highest Approach Volume = 110 (44) VPH



Wawona Road Total of Both Approaches =

649 (598) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Not Met

PM Peak Hour – Signal Warrant is Not Met

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