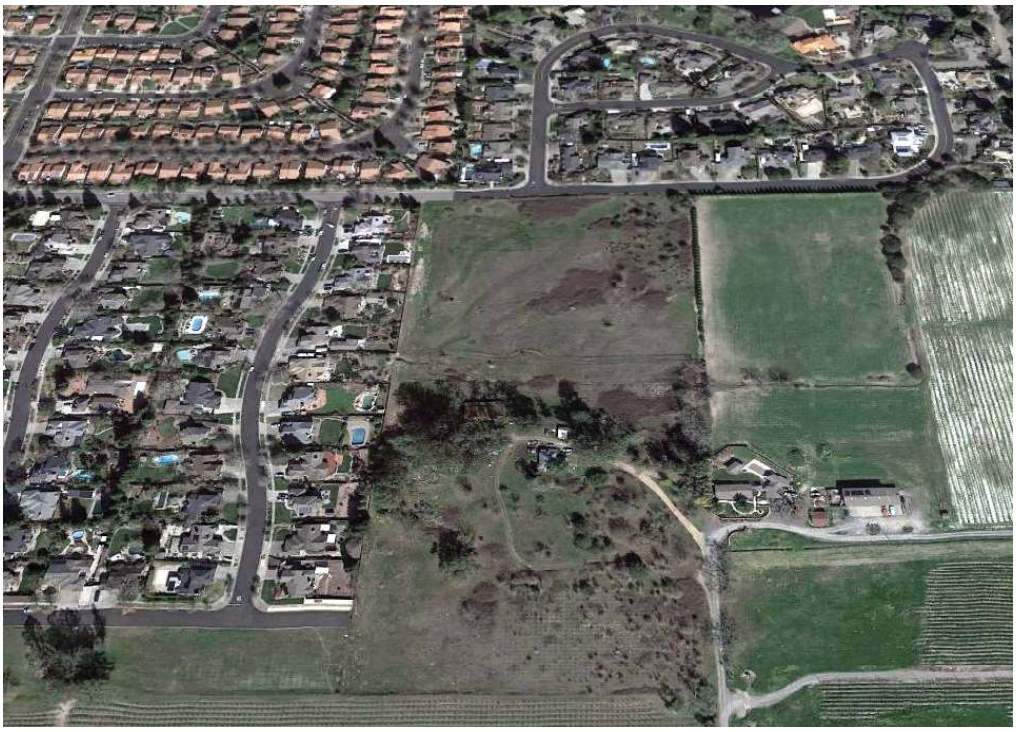
Traffic Impact Study for The Estates at Ross Ranch



Prepared for the Town of Windsor

Submitted by
W-Trans

August 25, 2022

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Introduction

This report presents an analysis of the potential mobility impacts that would be associated with a proposed residential development to be located at 1295 Jensen Lane in the Town of Windsor. The traffic study was completed in accordance with the criteria established by the Town of Windsor and is consistent with standard traffic engineering techniques.

Prelude

The purpose of a traffic impact study is to provide Town staff and policy makers with data that they can use to make an informed decision regarding the potential transportation impacts of the proposed project, and any associated improvements that would be required to mitigate these impacts to an acceptable level under the California Environmental Quality Act (CEQA), the Town's General Plan, or other policies. This report provides an analysis of those items that are identified as areas of environmental concern under the CEQA. Impacts associated with access for pedestrians, bicyclists, and to transit; the vehicle miles traveled (VMT) generated by the project; and safety concerns are addressed in the context of the CEQA criteria. While no longer a part of the CEQA review process, vehicular traffic service levels at key intersections were evaluated for consistency with General Plan policies by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on anticipated travel patterns specific to the proposed project, then analyzing the effect the new traffic would be expected to have on the study intersections and need for improvements to maintain acceptable operation.

The report is organized to provide background data that supports the various aspects of the analysis, followed by the assessment of CEQA issues and then evaluation of policy-related issues.

Project Profile

The proposed project includes development of 31 single-family residential homes. As part of the project, a new street called Portland Way would extend southward from the existing intersection at Vinecrest Road/Vinecrest Circle, and in the southern portion of the site, Prince George Way would be extended eastward from its current terminus by approximately 550 feet. A mini roundabout would be constructed at the Vinecrest Road/Vinecrest Circle-Portland Way intersection. Jensen Lane would be constructed along the eastern project boundary, including two travel lanes and a sidewalk along the project frontage. The project site is located near the eastern Windsor Town limits and Urban Growth Boundary between Vinecrest Road and Prince George Way, as shown in Figure 1.



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Figure 1 – Study Area and Existing Lane Configurations

Transportation Setting

Study Area and Periods

The study area varies depending on the topic. For pedestrian trips it consists of all streets within a half-mile of the project site that would lie along primary routes of pedestrian travel, or those leading to nearby generators or attractors. For bicycle trips it consists of all streets within one mile of the project site that would lie along primary routes of bicycle travel. For the safety and operational analyses, it consists of the project frontage and the following intersections:

1. Hembree Lane/Vinecrest Road
2. Vinecrest Road/Vinecrest Circle
3. Hembree Lane/Jensen Lane
4. Hembree Lane/Old Redwood Highway

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

Study Intersections

Hembree Lane/Vinecrest Road is a three-legged all-way stop-controlled intersection. A marked crosswalk is present on the east leg and bicycle lanes are available on all legs of the intersection.

Vinecrest Road/Vinecrest Circle is a three-legged two-way stop-controlled intersection with stop control on the southbound Vinecrest Circle approach. Marked crosswalks do not exist at this intersection but a westbound bicycle lane is present on the west leg of the intersection.

Hembree Lane/Jensen Lane is a tee intersection with stop controls on all approaches. Marked crosswalks are available on the north and east legs while bicycle lanes exist on the north and south legs of the intersection. The intersection also includes a western Jensen Lane leg that is closed to vehicular traffic, but open for pedestrians and bicyclists.

Hembree Lane/Old Redwood Highway is a signalized intersection with protected left-turn phasing on the northbound and southbound Hembree Lane approaches and protective-permissive left-turn phasing with flashing yellow arrow (FYA) operation on eastbound and westbound approaches on Old Redwood Highway. Marked crosswalks exist on the north, south, and east leg of the intersection and bicycle lanes are present on all four legs.

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

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available is August 1, 2016 through July 30, 2021.

As presented in Table 1, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2016 Collision Data on California State Highways*, California Department of Transportation (Caltrans). These average rates statewide are for intersections in the same urban environment, with the same number of approaches, and the same controls. No reported collisions have occurred at the Vinecrest Road/Vinecrest Circle or Hembree Lane/Jensen Lane intersections. The single reported collision at Hembree Lane/Vinecrest Road entailed a violation with a driver turning left in front of another driver who had the right-of-way. The intersection at Hembree Lane/Old Redwood Highway was found to have a collision rate slightly above the statewide average so was further reviewed. The collision rate calculations are provided in Appendix A.

Table 1 – Collision Rates for the Study Intersections

Study Intersection	Number of Collisions (2016-2021)	Calculated Collision Rate (c/mve)	Statewide Average Collision Rate (c/mve)
1. Hembree Ln/Vinecrest Rd	1	**0.11**	0.07
2. Vinecrest Rd/Vinecrest Cir	0	0.00	0.09
3. Hembree Ln/Jensen Ln	0	0.00	0.07
4. Hembree Ln/Old Redwood Hwy	8	**0.27**	0.24

Note: c/mve = collisions per million vehicles entering; **Bold** text indicates higher than the statewide average

At the Hembree Lane/Old Redwood Highway intersection, three of the eight reported collisions involved sideswipes, one of which involved a solo driver hitting a fixed object and one of which the driver was driving under the influence. The directions of travel and/or turning movement combinations were different for each of the three sideswipe collisions (one westbound vs. eastbound, one southbound vs. eastbound, and one northbound hitting a fixed object). Three of the reported collisions were broadsides. Two of the broadsides involved drivers on Old Redwood Highway turning left onto Hembree Lane, one in the eastbound direction and one in the westbound direction, though both occurred prior to the Town upgrading the signal to include flashing yellow arrow (FYA) operation; no reported broadside or other collision types involving left-turns from Old Redwood Highway have occurred since the signal was upgraded. Of the remaining two collisions, one was a head-on involving a driver under the influence, and the other was a rear-end on eastbound Old Redwood Highway approaching the intersection. Based on this review, and in consideration of signal modifications made by the Town in 2019 as well as the minimal amount by which the average rate is exceeded, there are no apparent collision trends indicative of a potential safety concern at the intersection.

Project Data

The project consists of 31 detached single-family homes. Most of the residential lots would range in size from 0.3 to 0.6 acres, while four lots on the eastern project boundary would be larger and range from 0.8 to 1.0 acre. The project would include construction of a segment of Jensen Lane along its frontage south of Vinecrest Road. Prince George Way would be extended eastward to connect to the segment of Jensen Lane that would be constructed as part of the project, and a new north-south street called Portland Way would pass through the center of the development between Prince George Way and Vinecrest Road, forming a new southern leg at the existing Vinecrest Road/Vinecrest Circle intersection. The proposed project site plan is shown in Figure 2.

Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 11th Edition, 2021 for "Single Family Detached Housing" (ITE LU # 210). The expected trip generation potential for the proposed project is indicated in Table 2. The proposed project is expected to generate an average of 292 trips per day, including 22 trips during the a.m. peak hour and 29 during the p.m. peak hour.

Table 2 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Single Family Detached Housing	31 du	9.43	292	0.70	22	6	16	0.94	29	18	11

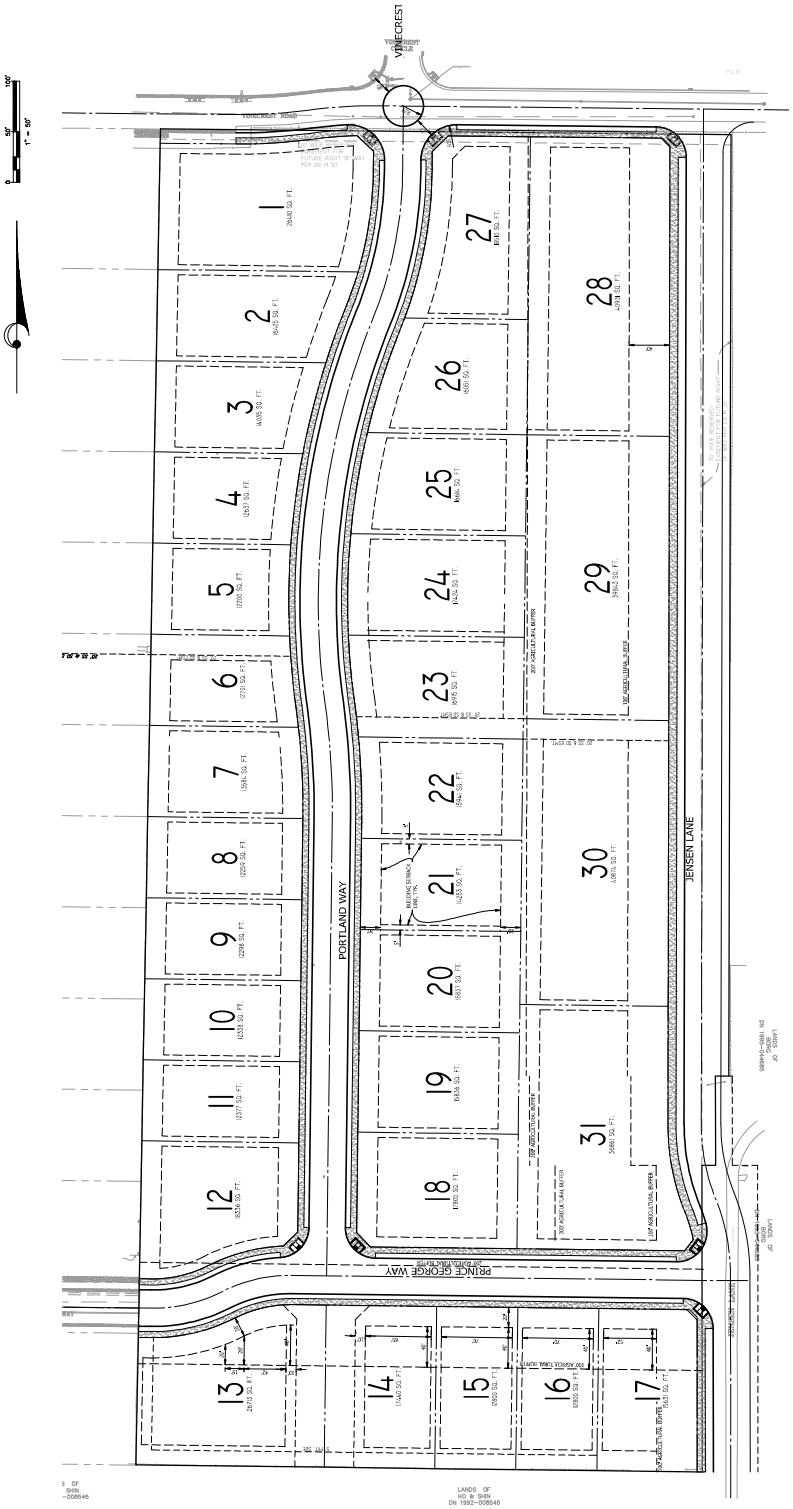
Note: du = dwelling unit

Trip Distribution

The pattern used to allocate new project trips to the street network was based on an analysis of existing turning movement data at the study intersections as well as local knowledge. The applied distribution assumptions and resulting trips are shown in Table 3.

Table 3 – Trip Distribution Assumptions

Route	Percent	Daily Trips	AM Trips	PM Trips
Hembree Ln north of Vinecrest Rd	24%	69	5	7
Old Redwood Hwy northwest of Hembree Ln	30%	87	7	9
Old Redwood Hwy southeast of Hembree Ln	28%	83	6	8
Hembree Ln south of Old Redwood Hwy	18%	53	4	5
TOTAL	**100%**	**292**	**22**	**29**



Source: T.D.G Consulting Civil Engineers, Inc. 4/22 win146.ai 10/21

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Figure 2 – Site Plan

Pedestrian Facilities

Existing and Planned Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. Existing pedestrian facilities along the proposed project site frontage as well as within a one-quarter mile distance of the project site were reviewed.

A connected pedestrian network does not currently exist along Vinecrest Road near the project site. There is a gap in the sidewalk network on the south side of the street along the entire Estates at Ross Ranch frontage, though connected sidewalks are present on the north side. Sidewalks planned to be built along the project frontage as part of the project would fill this gap. Further, based on the site plan, new streets with sidewalks would be constructed, including extensions of Jensen Lane from the current north terminus to Vinecrest Road and Prince George Way from the eastern terminus to Jensen Lane. Within the project site, Portland Way would also be built to the west of Jensen Lane and run north-south to connect Vinecrest Road and Prince George Way. All newly constructed streets would include sidewalks.

Pedestrian Safety

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue for pedestrians. Collision records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports were reviewed for the most current five-year period available, which was August 1, 2016 through July 31, 2021 at the time of the analysis. During the five-year study period there were no reported collisions involving pedestrians at the study intersections.

Project Impacts on Pedestrian Facilities

Pedestrian facilities at the project site would consist of new sidewalks constructed along the new streets within the development and on the project's Vinecrest Road and Jensen Lane frontages. The proposed project would include construction of the following pedestrian facilities.

- New sidewalks on the south side of Vinecrest Road along the entire project frontage
- New sidewalks on both sides of the Prince George Way street extension
- New sidewalks on both sides of the new internal street called Portland Way
- New sidewalks on the west side of Jensen Lane along the project frontage (sidewalks are not included on the east side of Jensen Lane as the area will remain undeveloped)

Pedestrian connectivity between the project site and existing neighborhoods to the north and west would be adequate upon completion of all proposed onsite and frontage improvements. Pedestrian connectivity to the south will be improved in the future as further development occurs.

Vinecrest Road and Prince George Way are designated as a local street in the Town's General Plan; Portland Way would also fall under the local street type. Per the Town's *Complete Street Design Guidelines* (CSDG), five-foot landscape zones and six-foot concrete sidewalks are required for this type of street. The segment of Jensen Lane along the eastern site boundary is designated in the 2040 General Plan as a rural lane and is required to provide a minimum six-foot wide path along the urban side of the street. The proposed project includes an eight-foot path plus an eight-foot landscape strip between the path and roadway, satisfying these standards.

Finding – Pedestrian connectivity to and from the project site would be adequate in the near-term and would improve in the future as developments to the south provide new sidewalk and pathway extensions. Pedestrian facilities would meet the requirements specified in the *Complete Street Design Guidelines*.

Recommendation – No additional measures to improve pedestrian circulation would be required.

Bicycle Facilities

Existing and Planned Bicycle Facilities

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

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

In the project area, Class II bike lanes exist on Vinecrest Road between Hembree Lane and Vinecrest Circle as well as on Hembree Lane between Arata Lane-Foothill Drive and Shiloh Road. According to the *Windsor Bicycle and Pedestrian Master Plan,* 2014, Class II bicycle lanes on Vinecrest Road are planned to be extended to the east as a Class III bicycle route between Vinecrest Circle and Vinecrest Road, which includes the project frontage. Other planned bicycle facilities in the project area include Class III bicycle routes on Foothill Drive and the entire east-west length of Jensen Lane as well as the Class I Jensen Trail along the north-south segments of Jensen Lane. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project study area. Table 4 summarizes the existing and planned bicycle facilities in the project vicinity.

Table 4 – Bicycle Facility Summary

Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
Vinecrest Rd	II	0.53	Hembree Ln	Vinecrest Cir
Hembree Ln	II	2.60	Arata Ln/Foothill Dr	Shiloh Rd
Planned				
Vinecrest Rd	III	0.14	Vinecrest Cir	Vinecrest Rd
Foothill Dr	III	1.00	Brooks Rd S	Vinecrest Rd
Jensen Trail	I	0.50	Jensen Ln	Pleasant Ave
Jensen Ln	III	0.79	3rd St	End of Jensen Ln

Source: *Windsor Bicycle and Pedestrian Master Plan*, Sonoma County Transportation Authority, 2014

Bicyclist Safety

Collision records for the study area were reviewed to determine if there had been any bicyclist-involved crashes. During the five-year study period between August 1, 2016 through July 31, 2021, there was no reported collision involving a bicyclist at any of the study intersections.

Project Impacts on Bicycle Facilities

As part of its frontage improvements the project would improve Vinecrest Road to include full curb, gutter, and sidewalk, and provide sufficient space to effectively accommodate bicyclists on the planned Class III bike route. The project would also complete the Class I Jensen Trail along its eastern frontage (i.e., on the west side of the street), consistent with the Town's bike plan. Bicyclists would be able to access the surrounding bike network via existing bike lanes on Vinecrest Road, Hembree Lane, Arata Lane, and Old Redwood Highway.

Finding – Existing and planned bicycle facilities would provide adequate access for bicyclists traveling to and from the project.

Recommendation – No additional measures to improve bicycle circulation would be required.

Transit Facilities

Existing Transit Facilities

Local School Bus

The Windsor Unified School District (WUSD) provides school bus services throughout Windsor to all its school campuses. For the morning home-to-school trip, Route 5 provides service from residences in the northeastern part of the Town to Windsor Middle School, Brooks Elementary School, and Mattie Washburn Elementary School. The buses for this route operate between 7:00 a.m. and 8:20 a.m. with a scheduled stop at Vinecrest Road/St. James Place at 7:07 a.m. During the afternoon, Route 4 provides school-to-home bus service between 2:15 p.m. and 4:25 p.m. and is scheduled to stop at Vinecrest Road/St. James Place at 3:29 p.m.

Sonoma County Transit

Sonoma County Transit (SCT) provides fixed-route bus services in the Town of Windsor and within the County of Sonoma. The transit stop nearest the project site is located on Hembree Lane near Vinecrest Road and is served by SCT Route 66 which is a loop route that runs along Hembree Lane. Plate 1 shows this route. The buses for this

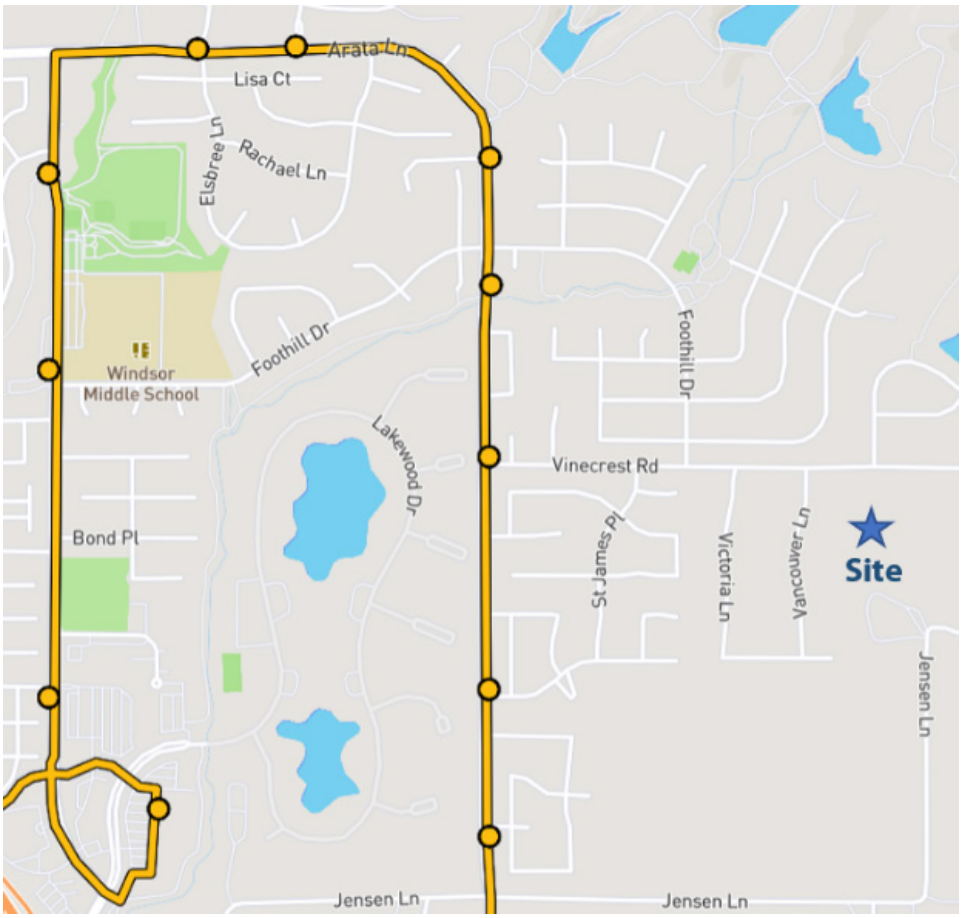


Plate 1 Sonoma County Transit Route 66 near Project Site

route are currently operating with approximately one-hour headways between 7:45 a.m. and 5:00 p.m. from Monday through Saturday.

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

Dial-a-ride, also known as paratransit, or door-to-door service, is available for those who are unable to independently use the transit system due to a physical or mental disability. SCT Paratransit is designed to serve the needs of individuals with disabilities within the Town of Windsor and the greater Sonoma County area.

Impact on Transit Facilities

Given the size of the proposed project, there is unlikely to be substantial new demand for transit service generated by the development, though it is likely that some residents or visitors will occasionally choose to use transit. Upon completion of the project's proposed sidewalks on Vinecrest Road, continuous pedestrian facilities would effectively link the site to the existing SCT bus stop on Hembree Lane as well as the school bus stop at St. James Place. Walking distances to the SCT bus stop would be in the range of one-half to three-quarters of a mile, and walking distances to the school bus stop between one-quarter and one-half of a mile.

Finding – Existing public transit and school bus routes are adequate to accommodate the additional demand generated by the project, and existing bus stops accessible via continuous sidewalks are within an acceptable walking distance of the site. Transit facilities serving the project site are therefore considered to be adequate.

Recommendation – No additional measures to improve transit facilities would be required.

Vehicle Miles Traveled (VMT)

Background

The Vehicle Miles Traveled (VMT) associated with a project is the primary basis for determining traffic impacts under CEQA. Because the Town of Windsor has not yet adopted standards of significance for evaluating VMT, guidance provided by the California Governor's Office of Planning and Research (OPR) in the publication *Transportation Impacts (SB 743) CEQA Guidelines Update and Technical Advisory*, 2018, was used (referred to herein as the Technical Advisory). These criteria are consistent with those applied by Caltrans as outlined in the *Vehicle Miles Traveled-Focused Transportation Impact Study Guide*, California Department of Transportation, May 2020.

Significance Threshold

The OPR Technical Advisory provides VMT threshold guidance for several land use types. Residential uses are assessed using a home-based VMT per capita metric, with VMT significance thresholds set at a level of 15 percent below the citywide or regional average. The Technical Advisory indicates that it may be appropriate to apply a countywide, rather than regional, average if most people both live and work within the smaller geographic area. According to data contained in the *Sonoma County Travel Behavior Study*, SCTA, 2020, approximately 97 percent of Windsor's vehicle trips remain within Sonoma County. Use of a common model to produce both project-level and threshold values also allows for a clear "apples to apples" assessment. Accordingly, the applied significance threshold is based on the Sonoma County per-capita VMT average rather than the nine-County Bay Area regional average.

SCTA operates and maintains the regional travel demand model that produces baseline VMT estimates. The VMT thresholds and projections applied in this analysis reflect the SCTM19 model updated in December 2021, which remains the current version as of the April 2022 timeframe of this analysis. Based on output from the SCTA model, the existing average residential VMT per capita in the County of Sonoma is 16.60 miles. VMT significance thresholds are set at 15 percent below this level, or 14.11 miles. Accordingly, the applied VMT significance threshold applied to the project is as follows.

- The project would have a potentially significant impact on VMT if its projected residential VMT per Capita exceeds 14.11 miles.

Project VMT Assessment

VMT per Capita

The SCTA model includes traffic analysis zones (TAZ) covering geographic areas throughout Sonoma County. The Estates at Ross Ranch project site is located within TAZ 873, which has a baseline VMT per capita of 16.38 miles. Based on the model, for the project to achieve the applied threshold of 15 percent below the Countywide average, its projected VMT per capita would need to be reduced by 13.9 percent.

Consideration was given to whether adjustments to the baseline per-capita VMT estimates produced by the SCTA model are warranted to reflect project-specific details. The most common adjustments pertain to project density, provision of affordable housing, mix of uses, and off-site improvements to non-auto travel networks. The overall residential density associated with the project reflects a suburban development pattern and does not necessitate adjustments to the baseline VMT projections. With respect to affordable housing, the project would not provide onsite affordable units, so no adjustments have been applied. The project does not include neighborhood-serving retail or service functions that could reduce resident VMT, so no use-related VMT adjustments are applicable. The

project would provide required on-site pedestrian facilities including sidewalks along street frontages, with no new proposed offsite facilities.

Modest VMT reductions can be achieved through implementation of traffic calming measures on surrounding streets. The proposed Estates at Ross Ranch project would construct a mini roundabout at the Vinecrest Circle-Portland Way intersection, helping to calm traffic on the corridor and incentivize non-auto travel. Based on information contained in the current and prior CAPCOA publication, this improvement can be expected to reduce VMT by approximately 0.3 percent.

Based on this assessment, the baseline SCTA VMT projection has been reduced by 0.3 percent to reflect incorporation of traffic calming measures. The VMT findings are shown in Table 5.

Table 5 – Vehicle Miles Traveled Analysis Summary

VMT Metric	Baseline VMT Rate (Countywide Avg)	Significance Threshold (15% Below Countywide Avg)	Project VMT per Capita	
			Project Site TAZ 873[1]	Meets Threshold?
Residential VMT per Capita (Countywide Baseline)	16.60	14.11	16.33	No

Notes: VMT Rate is measured in VMT per Capita, or the number of daily miles driven per resident; TAZ=Traffic Analysis Zone; [1] includes 0.3 percent adjustment to default SCTA model values to reflect implementation of traffic calming

Finding – The project is not expected to meet the applicable significance threshold for vehicle miles traveled.

VMT Reduction Strategies

As noted above, for the project to fall below the VMT target set according to State guidance, its VMT would need to be reduced by 13.9 percent. Following is a discussion of potential strategies that could be applied to the site, in recognition of its suburban context.

Integrate Affordable Housing

Research indicates that the VMT generated by residents of deed-restricted affordable housing is less than that generated by residents of market-rate housing. Because the proposed project involves a larger-lot single-family home development, designation of one or more lots for deed-restricted affordable housing may be unrealistic, and integration of onsite units would likely require more extensive modifications to the project description and site plan. Exploring mechanisms to construct income-restricted accessory dwelling units (ADUs) on some or all lots may be an option. Hypothetically, if the project were able to be modified such that 15 percent of total units (including homes and ADUs) were designated for low-income residents, the project's overall VMT per capita would decrease by approximately 1.5 percent based on a methodology published in *Income, Location Efficiency, and VMT: Affordable Housing as a Climate Strategy*, The California Housing Partnership, 2015.

Pedestrian and Bicycle Network Improvements

In some cases, a project's VMT may be effectively reduced by making off-site improvements to the pedestrian and bicycle networks, particularly where gaps in these networks are filled in a manner that would have a meaningful effect on whether residents walk or drive. In considering the effectiveness of such improvements, the proximity of nearby pedestrian and bicycle "attractors" must be considered. Shifting resident travel modes from automobiles to walking and biking can be difficult in suburban contexts like the Estates at Ross Ranch project area given the lack of nearby attractors (such as shopping and employment centers) and location on the urban edge. Note that pedestrian and bicycle amenities *within* the project site would be required by the Town regardless, so

these are considered standard improvements that, while very important, do not reduce the project's overall VMT below levels exhibited by similar types of development.

It may still be possible for the project to slightly reduce its VMT by constructing offsite pedestrian and bicycle improvements such as a paved pathway between the southeast corner of the project site and the segment of Jensen Lane to the south as called for in the Town's Bicycle and Pedestrian Master Plan, and installing pedestrian crossing with median island refuge on the east leg of the Vinecrest Road/Foothill Drive intersection. Based on data contained in *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*, ULI, 2009 as well as methodologies contained in the San Jose VMT Evaluation Tool, it is estimated that VMT reductions associated with such improvements in the vicinity of the project site may be between 0.5 and 1.0 percent. Note that the ability to construct offsite improvements on land that is not controlled by the applicant or within the public right-of-way may be limited.

Neighborhood Traffic Calming

As noted above, modest VMT reductions can be achieved through implementation of traffic calming measures both within the project site and on nearby streets, since these measures tend to improve pedestrian and bicycle circulation and safety, incentivizing travel by non-auto modes. The proposed Estates at Ross Ranch project would construct a mini roundabout at the Vinecrest Circle-Portland Way intersection. The potential enhanced pedestrian crossing with median refuge on the east leg of Vinecrest Road/Foothill Drive, as mentioned above, could serve as an additional neighborhood traffic calming measure; based on information contained in the current and prior CAPCOA publication, this additional measure would be expected to result in an additional VMT reduction of approximately 0.2 percent.

Overall Effectiveness of VMT Reduction Measures

To reduce the amount of VMT generated, it is recommended that the project be revised as feasible to incorporate on-site deed-restricted affordable housing units including units restricted for individuals and families in lower income categories. The project should also be required to incorporate bulbouts at new or reconfigured intersections, install a mini roundabout at the Vinecrest Road/Vinecrest Circle-Portland Way intersection, and construct an enhanced pedestrian crossing including refuge median on the west leg of the Vinecrest Road/Foothill Drive intersection.

With implementation of these VMT reduction measures, it is estimated that the project could potentially reduce its per capita VMT by two to three percent. While beneficial, these reductions would not be sufficient to reduce the project's VMT by the 13.9 percent needed to fall below the below the VMT significance threshold.

Finding – Even with incorporation of VMT reduction strategies and measures, the project would not be expected to fall below applicable VMT per capita thresholds and would therefore have a significant VMT impact.

Recommendation – To the degree feasible, the project should Incorporate on-site affordable housing units (potentially including ADUs) for individuals and families in lower income categories.

Recommendation – The project should be required to construct an enhanced pedestrian crossing including a refuge median on the west leg of the Vinecrest Road/Foothill Drive intersection.

Additional VMT Reduction Measures Not Selected

Several transportation demand management (TDM) and VMT reduction strategies were evaluated but ultimately deemed inappropriate or ineffective for the Estates at Ross Ranch project. Following is a list of other measures considered and the reasons why they were not recommended.

- **Increase Residential Density** – The publication *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity*, California Air Pollution Control Officers Association (CAPCOA), 2021, includes a methodology to determine the VMT reductions associated with increases in residential density. Per the CAPCOA methodology, a minimum density of 9.1 units per acre would need to be achieved before VMT reduction benefits are realized. Since this level of density is substantially higher than proposed by the project and is inconsistent with the site's General Plan land use designation and zoning, it does not appear to be applicable to the proposed project.

- **Subsidized Transit Passes** – Transit pass subsidies are a relatively common mitigation measure for multi-family housing, most often being implemented in areas with greater transit accessibility. While the proposed project is one-half to three-quarters of a mile from a bus route operated by Sonoma County Transit line, its proximity to the urban edge suggests that the area is unlikely to ever be served by frequent transit service or multiple transit lines, and the ultimate effectiveness of providing subsidized transit passes is quite limited from a VMT reduction perspective. The project's single-family housing type also complicates the viability of establishing a transit subsidy program. Given these factors, subsidized transit passes were not recommended as a VMT reduction strategy.

- **Carsharing** – Services such as Zipcar can provide a valuable incentive for some residents to forgo vehicle ownership. However, in a more suburban context, carsharing loses its effectiveness which explains why carsharing services are limited in suburban locations to places such as academic campuses. In this case, carsharing would likely have such a minimal impact that it was not recommended.

- **Ridematching** – Ridematching programs such as 511.org's *Merge* platform are cost-effective means to pair carpool and vanpool riders with each other. However, these programs are generally best suited based on an employee's job location rather than home location, which is the reason they are most commonly deployed by businesses as opposed to residences. While it is also possible for such programs to be overseen by a homeowner's association, the relatively small size of the proposed project would significantly limit its overall effectiveness. As such, it was not recommended.

- **Reduced Parking Supply** – The amount of parking provided in a residential development can be directly correlated with its generation of VMT. Therefore, in some cases a reduction in the parking supply below zoning requirements (or the calculated peak demand) can lower VMT. This strategy is most effective in areas well-served by transit, where space for onsite parking is physically limited, and where alternative free parking options do not exist nearby. None of these conditions exist in the project area, so the measure was not recommended.

- **VMT Mitigation Bank and/or Fee** – It is likely that regional VMT mitigation banks or VMT mitigation fee programs will be established in the coming years, allowing developments to mitigate potential VMT impacts by contributing funds to local or regional VMT-reducing improvements. While these sorts of programs and funding mechanisms hold much promise, they are anticipated to take several years to establish, and as of this writing no agencies in Sonoma County have commenced such efforts. Accordingly, they were not recommended for this project.

Safety Issues

The potential for the project to impact safety was evaluated in terms of the adequacy of sight distance and need for turn lanes at the project accesses, as well as the adequacy of stacking space in left-turn lanes at the study intersections.

Site Access

Primary access to the site would be via Vinecrest Road. A new street called Portland Way would extend southward into the project site from Vinecrest Road, forming a new southern leg at the Vinecrest Road/Vinecrest Circle intersection. A mini roundabout would be constructed at this intersection. The project would also include construction of a section of Jensen Lane along its eastern frontage and extend Prince George Way eastward in the southern portion of the site. In the future, the Windsor General Plan indicates that Jensen Lane will be improved south of the site as a Rural Lane, and a new Rural Lane roadway linkage established between the existing improved section of Jensen Lane and Pleasant Avenue. The project is constructing a portion of this roadway along its eastern boundary. These future roadways would create additional options for project residents to access Hembree Lane, Pleasant Avenue, and Old Redwood Highway.

Jensen Lane Interim Condition

The segment of Jensen Lane to the south of the project site is currently an unimproved one-lane roadway that functions as a driveway to several parcels in the unincorporated County. While it is expected that the roadway will be improved to public street standards consistent with its Rural Lane designation in the Windsor General Plan as part of future development, the timing of such improvements is unknown. In the interim, the roadway's current configuration is inadequate to accommodate project traffic. It is recommended that an interim gated access be installed at the southern terminus of the Jensen Lane street segment to be constructed by the project. The gate would be removed in the future once Jensen Lane is fully improved.

Recommendation – A gate should be installed at the southern terminus of the Jensen Lane segment to be constructed by the project, preventing vehicular traffic from the project and points northward from using the currently unimproved segment of Jensen Lane to the south. The gate would be removed in the future once Jensen Lane is improved to public street standards.

Sight Distance

Sight distance along Vinecrest Road at the proposed new Portland Way leg opposite Vinecrest Circle was evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. The recommended sight distance at intersections of public streets is based on corner sight distances, using the approach travel speeds as the basis for determining the recommended sight distance. Additionally, the stopping sight distance needed for a following driver to stop if there is a vehicle waiting to turn into a side street or driveway is evaluated based on stopping sight distance criterion and the approach speed on the major street. For the posted 35 mph speed on Vinecrest Road just west of the intersection, the required corner sight distance is 385 feet while the required stopping sight distance is 250 feet.

Since the new Portland Way street serving the project site has not yet been constructed, available sight distances were estimated based on field review as well as measurements using aerial photographs. Vinecrest Road is free of vertical curves in the area and is free of horizontal curves to the east of the proposed Portland Way intersection. To the west of the intersection, Vinecrest Road has a slight centerline shift of approximately nine feet through a gradual reverse curve which would not substantially alter sight distance. An existing brick monument sign on the southwest intersection corner that says "Vinecrest Estates" would, however, obstruct visibility for drivers looking

from Portland Way to the west. This monument sign would be removed or relocated upon construction of the mini roundabout; with this change and implementation of the mini roundabout, it appears that adequate sight lines could be established. Sight distances on both directions of Vinecrest Road would exceed 750 feet in both directions, which would meet the required criteria for speeds in excess of 50 mph and would be considered adequate.

The remaining intersections created by development of the project site are anticipated to be low-volume roadways with 25 mph speeds. Similar to the future Vinecrest Road/Portland Way intersection, the Prince George Way/Portland Way and Prince George Way/Jensen Lane intersections are shown to have slight centerline shifts near intersections, though sufficient sight lines are anticipated to exist as long as landscaping remains low-profile and no fences exceeding 3.5 feet in height are placed near intersection corners. It is recommended that sight distance be confirmed at all new intersections as landscaping plans are submitted.

Finding – Sufficient sight distance is generally anticipated to be available at new intersections created by the project.

Recommendation – Sight distance requirements should be confirmed at the project intersections during the Town's review of landscaping plans.

Access Analysis

The intersections created by or modified by the proposed project would be on low-volume, low-speed streets, and based on the results of the operational analysis described later in this report, would be expected to operate acceptably at LOS A. Accordingly, the intersections are anticipated to function acceptably from both operational and safety perspectives with single-lane approaches and no dedicated turn lanes.

Queuing

The *Town of Windsor 2040 General Plan*, adopted in April 2018, contains the following policy applicable to queuing.

> **Policy M-3.17 - Queuing**. *Intersection queuing shall be evaluated in tandem with LOS. Projected 95th percentile queues in left-turn pockets do not exceed the available stacking length. A queuing impact shall be considered significant if:*
>
> *a) The 95th percentile queue length can be contained within the available stacking length without the project, and the project causes the queue to exceed the stacking length; or*
>
> *b) The queue length exceeds the available stacking length without the project and the project increases the 95th percentile queue by more than 10 feet, or approximately one-half a car-length.*
>
> *Exceptions to this policy may be granted by the Town Engineer, where there is sufficient block length to accommodate projected queuing or physical constraints that make it infeasible to construct the improvement that would be necessary to achieve adequate stacking length, such as geometrics, a lack of right-of-way, adjacent slopes or hills, and soil conditions.*

The Town's queuing policy would apply at the Hembree Lane/Old Redwood Highway study intersection which has left-turn pockets on all four approaches. The remaining study intersections do not have left-turn pockets.

Queues in left-turn pockets were determined using the SIMTRAFFIC application of Synchro, averaging the projected 95th percentile queues for ten simulation runs. Summarized in Table 6 are the predicted queue lengths for all analysis scenarios. Copies of the SIMTRAFFIC projections are contained in Appendix B.

Table 6 – 95th Percentile Left-Turn Queues at Hembree Lane/Old Redwood Highway

Study Intersection	Available Storage	95th Percentile Left-Turn Queues							
		AM Peak Hour				PM Peak Hour			
		E	E+P	F	F+P	E	E+P	F	F+P
Northbound Hembree Ln	160	80	82	122	119	110	112	157	158
Southbound Hembree Ln	110	**153**	**157**	**252**	**258**	62	71	**123**	**129**
Eastbound Old Redwood Hwy	195	51	67	75	87	77	77	164	166
Westbound Old Redwood Hwy	200	31	34	40	42	24	50	28	33

Notes: 95th percentile queue based on the average of ten SIMTRAFFIC runs; all distances are measured in feet; E = existing conditions; E+P = existing plus project conditions; F = future conditions; F+P = future plus project conditions; future scenarios reflect worst-case without Jensen extension (Eastside Connector); **Bold** text = queue length exceeds available storage

Left-turn queues currently exceed available storage in the southbound left-turn lane during the a.m. peak hour. This condition is projected to occur in all a.m. peak hour scenarios and develop under future conditions during the p.m. peak hour. The addition of project-generated traffic would increase the 95th percentile queue lengths in this turn pocket by approximately four to six feet during impacted periods, which per the Town's criteria would not be considered a significant impact. Note that the future queuing projections reflect a worst-case condition in which Jensen Lane is not extended; with the Jensen Lane extension (Eastside Connector) the southbound left-turn queues would reduce somewhat, though would still exceed storage. The project's contribution to queues would be less, however, since a portion of the project volumes associated with travel to the southeast would travel via Jensen Lane instead of passing through the Hembree Lane/Old Redwood Highway intersection.

Upon reviewing the queuing projections and simulation runs, it was noted that the southbound left-turn movement would have the longest queues on the approach, that average queues are considerably shorter at 135 feet, and that occurrences during which the adjacent southbound through lane is blocked tend to last less than ten seconds. This is supported by review of the operational analysis which shows future delays on the southbound approach in the LOS C range, suggesting that congestion is not a major concern. For these reasons, the projected queues are not considered to present an adverse safety concern that warrants corrective measures such as widening Hembree Lane to add more queuing capacity. One potential measure the Town could pursue to reduce queues (regardless of whether the Estates at Ross Ranch project is completed) would be to implement protected-permitted left-turn phasing on both Hembree Lane intersection approaches. This is the same phasing including flashing yellow arrow that currently exists on the Old Redwood Highway approaches. With this change, 95th percentile queues during the worst-case future plus project a.m. peak hour would be reduced from 258 feet to 181 feet.

The projected 95th percentile queues on the northbound, eastbound, and westbound intersection approaches are anticipated to remain within the available storage.

Finding – Queuing in the southbound left-turn pocket at Hembree Lane/Old Redwood Highway exceeds the storage capacity under existing conditions, and would continue to do so in the future, though such occurrences would be brief and are not anticipated to result in adverse safety or operational effects. Traffic generated by the proposed project would be responsible for increasing these queues by four to six feet, which per the Town's criteria does not constitute a significant impact.

Recommendation – No additional measures to address queuing would be required.

Vinecrest Road Speeds and Potential for Traffic Calming

Vinecrest Road is depicted as a local street on the Town's General Plan Circulation System map. Within the local street category, the roadway functions as a "connector" street as described in the Town's *Complete Street Design Guidelines*. Local connector streets typically carry traffic volumes in the range of 4,000 to 8,000 vehicles per day.

The current Engineering and Traffic Survey (E&TS) completed for Vinecrest Road, which is used to establish speed limits per State law requirements, indicates an average surveyed speed of 33 mph and an 85th percentile speed of 37 mph. The posted speed limit is 35 mph. The E&TS indicates that zero reported collisions had occurred on the corridor, and that the average daily volume is 2,100 vehicles.

From a qualitative perspective, Vinecrest Road has the appearance of what most motorists typically perceive to be a moderate speed street. Contributing characteristics include a general lack of direct driveways to homes, no on-street parking, and a straight alignment with all traffic controls placed only on side streets. This context typically conveys to drivers, whether directly or perceived, that it is acceptable to drive faster than the typical 25-mph speed required on local residential streets with fronting residences.

Based on guidance provided in the *Complete Street Design Guidelines*, local connector streets should generally have a design speed of 30 mph, which is less than the current 35-mph posted speed limit. Rather than attempting to influence driver speeds by changing the posted limits, alternative measures including traffic calming may be considered. Ultimately, implementation of traffic calming measures may reduce prevailing speeds sufficiently to then support a reduction in the posted speed consistent with State law requirements.

The proposed Estates at Ross Ranch is projected to increase daily volumes on Vinecrest Road by approximately 292 vehicles, or an increase of about 14 percent. Under future conditions with growth in the area, including the proposed project, daily traffic volumes are estimated to be approximately 3,200 vehicles. This would be on the low end of the typical range for a local connector street in Windsor. With respect to vehicle speeds, residents of the proposed project can reasonably be expected to drive on Vinecrest Road at similar speeds as existing residents, assuming that the current street configuration remains unchanged. Given these conditions and no demonstrated pre-existing safety concerns evidenced through collision records, the project would not in and of itself be expected to create an adverse safety condition on Vinecrest Road.

While the project would not be expected to produce a safety impact on Vinecrest Road, its construction does present the opportunity to implement traffic calming measures on the corridor. Such measures would also help to reduce the project's VMT impact as described above. The project would construct a mini roundabout at the Vinecrest Road/Vinecrest Circle-Portland Way intersection. Mini roundabouts are smaller than conventional roundabouts (such as those present on Old Redwood Highway near the Town Green) but remain fully navigable by larger vehicles including emergency responders and moving trucks since they do not have raised elements in the center island. They are appropriate for use on streets such as Vinecrest Road and can effectively calm traffic on the corridor without requiring all drivers to stop, as implementation of all-way stop controls would. Besides traffic calming, mini roundabouts generally have better traffic operation and result in lower vehicle emissions than all-way stops and can help to improve (or maintain) safety at the intersection and adjacent corridor by reducing vehicle speeds. The mini roundabout would be expected to operate at LOS A under near-term and long-range conditions. A local mini roundabout with similar size and character is on Grove Street at Farmstand Road in Healdsburg.

As noted in the VMT section, an additional traffic calming opportunity that would also enhance pedestrian circulation in the area would be to install a new crosswalk with a pedestrian median refuge on the east leg of the Vinecrest Road/Foothill Drive intersection. Sufficient space exists to provide an approximately four-foot-wide pedestrian refuge at this location while still maintaining 10-foot travel lanes and six-foot bike lanes.

Finding – The proposed project would not be expected to result in an adverse safety condition on Vinecrest Road.

Finding – The mini roundabout to be constructed by the proposed project would help to calm traffic on the Vinecrest Road corridor.

Recommendation – It is recommended that the project construct a pedestrian crossing with median refuge at Vinecrest Road/Foothill Drive to also serve as an effective neighborhood traffic calming strategy.

Emergency Access

The site plan for the project depicts an interconnected roadway system with no dead-end streets and four points of access to the surrounding roadway network. Three of the access points lead to Vinecrest Road including the primary project street (Portland Way), new Jensen Lane segment, and Prince George Way extension which leads to two residential streets accessing Vinecrest Road (Victoria Lane and Vancouver Lane). The new segment of Jensen Lane would also connect to the existing rural Jensen Lane roadway to the south, which will be upgraded to public street standards as future development occurs, and the long-range vision of an ultimate extension to Pleasant Avenue as depicted in the General Plan comes to fruition. As recommended in the site access assessment above, access between the project's improved segment of Jensen Lane and the currently unimproved segment to the south should be restricted, controlled by a gate or similar measure until such time that Jensen Lane is improved to public street standards. The gate should be configured such that it can be unlocked by emergency responders as needed, including for emergency evacuation purposes.

While the project's accommodation of emergency vehicles and evacuation needs will remain subject to review and approval by the Town's Fire Marshal, from a transportation perspective the proposed street configuration and connectivity would provide adequate emergency vehicle circulation and access.

The adequacy of emergency evacuation routes was assessed in consideration of potential fire threats approaching from wildland areas to the north, south, and east. The primary evacuation route for Windsor leading to designated evacuation centers is US 101; evacuation staging schemes established by emergency responders would in most circumstances focus on moving traffic along arterial streets to the freeway. For the Estates at Ross Ranch project, emergency evacuation staging for fire threats from the north would focus on directing drivers to Old Redwood Highway, ultimately continuing south of the Town, or accessing US 101 via Shiloh Road; such routes would exist via both Vinecrest Road and Jensen Lane (Eastside connector) including the future linkage to Pleasant Avenue. For fire threats from the east, which may be the most likely scenario, evacuation routes would also likely focus on directing residents to Vinecrest Road and/or Jensen Lane toward US 101 via either Old Redwood Highway or Arata Lane. While fire threats from the south may be less likely than threats from the north or east, several evacuation staging options would still exist, including directing drivers to either Arata Lane or Brooks Road via Foothill Drive.

It is important to reiterate that the Town's Fire Marshal has final authority over the adequacy of the project's emergency access and compliance with applicable codes and requirements.

Finding – The proposed roadway network, including connectivity to existing and future roads, would provide adequate emergency circulation and access from a transportation perspective.

Finding – The proposed roadway configuration would accommodate multiple evacuation staging schemes that could be used in the case of approaching wildland fire threats.

Finding – The project will be subject to review and approval by the Town's Fire Marshal; any requirements imposed by the Fire Marshal shall take precedence over the emergency access and circulation findings contained herein.

Recommendation – The interim gate recommended to be installed at the southern terminus of the Jensen Lane segment to be constructed by the project should be configured such that it can be unlocked by emergency responders as needed, including for emergency evacuation purposes.

Capacity Analysis

Intersection Level of Service Methodologies

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

The study intersections were analyzed using methodologies published in the *Highway Capacity Manual*, 6th Edition, Transportation Research Board, 2018. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle.

The Levels of Service for the intersections with side street stop controls, or those which are unsignalized and have one or two approaches stop controlled, were analyzed using the "Two-Way Stop-Controlled" intersection capacity method from the HCM. This methodology determines a level of service for each minor turning movement by estimating the level of average delay in seconds per vehicle. Results are presented for individual movements together with the weighted overall average delay for the intersection.

The study intersection with stop signs on all approaches was analyzed using the "All-Way Stop-Controlled" Intersection methodology from the HCM. This methodology evaluates delay for each approach based on turning movements, opposing, and conflicting traffic volumes, and the number of lanes. Average vehicle delay is computed for the intersection as a whole and then related to a Level of Service.

The study intersection that is currently controlled by a traffic signal was evaluated using the signalized methodology from the HCM. This methodology is based on factors including traffic volumes, green time for each movement, phasing, whether the signals are coordinated or not, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. For purposes of this study, delays were calculated using signal timing obtained from the Town of Windsor.

The ranges of delay associated with the various levels of service are indicated in Table 7.

Table 7 – Intersection Level of Service Criteria			
LOS	**Two-Way Stop-Controlled**	**All-Way Stop-Controlled**	**Signalized**
A	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.	Delay of 0 to 10 seconds. Upon stopping, drivers are immediately able to proceed.	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
B	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.	Delay of 10 to 15 seconds. Drivers may wait for one or two vehicles to clear the intersection before proceeding from a stop.	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
C	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.	Delay of 15 to 25 seconds. Drivers will enter a queue of one or two vehicles on the same approach and wait for vehicle to clear from one or more approaches prior to entering the intersection.	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
D	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.	Delay of 25 to 35 seconds. Queues of more than two vehicles are encountered on one or more approaches.	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
E	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side street.	Delay of 35 to 50 seconds. Longer queues are encountered on more than one approach to the intersection.	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
F	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.	Delay of more than 50 seconds. Drivers enter long queues on all approaches.	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

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

Traffic Operation Standards

While the operation of local intersections is no longer evaluated for purposes of determining potential impacts under CEQA, an analysis of the potential impacts on traffic operation was performed to determine consistency with the Town's adopted General Plan policies.

The *Town of Windsor 2040 General Plan*, adopted in April 2018, contains the following policy applicable to the operational analysis.

> **Policy M-3.16 – Level of Service Application.** *The Town shall maintain the level of service standards that define the minimum acceptable operating characteristics for intersections and streets. A level of service D (LOS D) is defined as the minimum acceptable level of congestion during the weekday morning and evening peak periods for high-volume facilities such as freeways, crosstown streets, and signalized or all-way stop-controlled intersections. This standard should apply at all these locations except the following intersections, which are regional gateways to the Town's commercial and civic areas, and where a Level of Service E is tolerated by the Town and considered acceptable:*
>
> - *Old Redwood Highway/US 101 Northbound off-ramp/Lakewood Drive*

- *Old Redwood Highway/US 101 Southbound ramps*
- *Old Redwood Highway/Conde Lane/Windsor River Road*

At side-street stop-controlled unsignalized intersections, levels of service shall be determined for both controlled movements and for the overall intersection. Controlled movements operating at LOS E or LOS F are allowable if: 1) the intersection is projected to operate at LOS C or better overall, and 2) the projected traffic volume on the controlled movement is 30 vehicles or less per hour on approaches with single lanes, or on multilane approaches, 30 vehicles or less per hour per lane. If an intersection is operating at LOS E or F without project-generated traffic added, the project's impact shall be considered less-than-significant if it does not cause operation to fall from LOS E to LOS F and it increases average delay for the intersection as a whole by 5 seconds or less. Level of service standards shall not apply to minor intersections comprised of only local streets.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. Traffic counts were obtained for the study intersections in late September 2021 while area schools were in session. "Big data" sources available through the provider Streetlight Data were used to compare current traffic volumes in Windsor with those observed in 2019 prior to the COVID-19 pandemic. Based on this review, it was determined that recent peak hour volumes on Windsor's arterials and collectors are generally equivalent to or greater than those occurring in 2019, indicating that it is unnecessary to factor current volumes to reflect a pre-pandemic condition.

Under existing conditions, all four study intersections are operating acceptably. A summary of the intersection Level of Service calculations is contained in Table 8, and copies of the calculations are provided in Appendix C. The existing traffic volumes are shown in Figure 3.

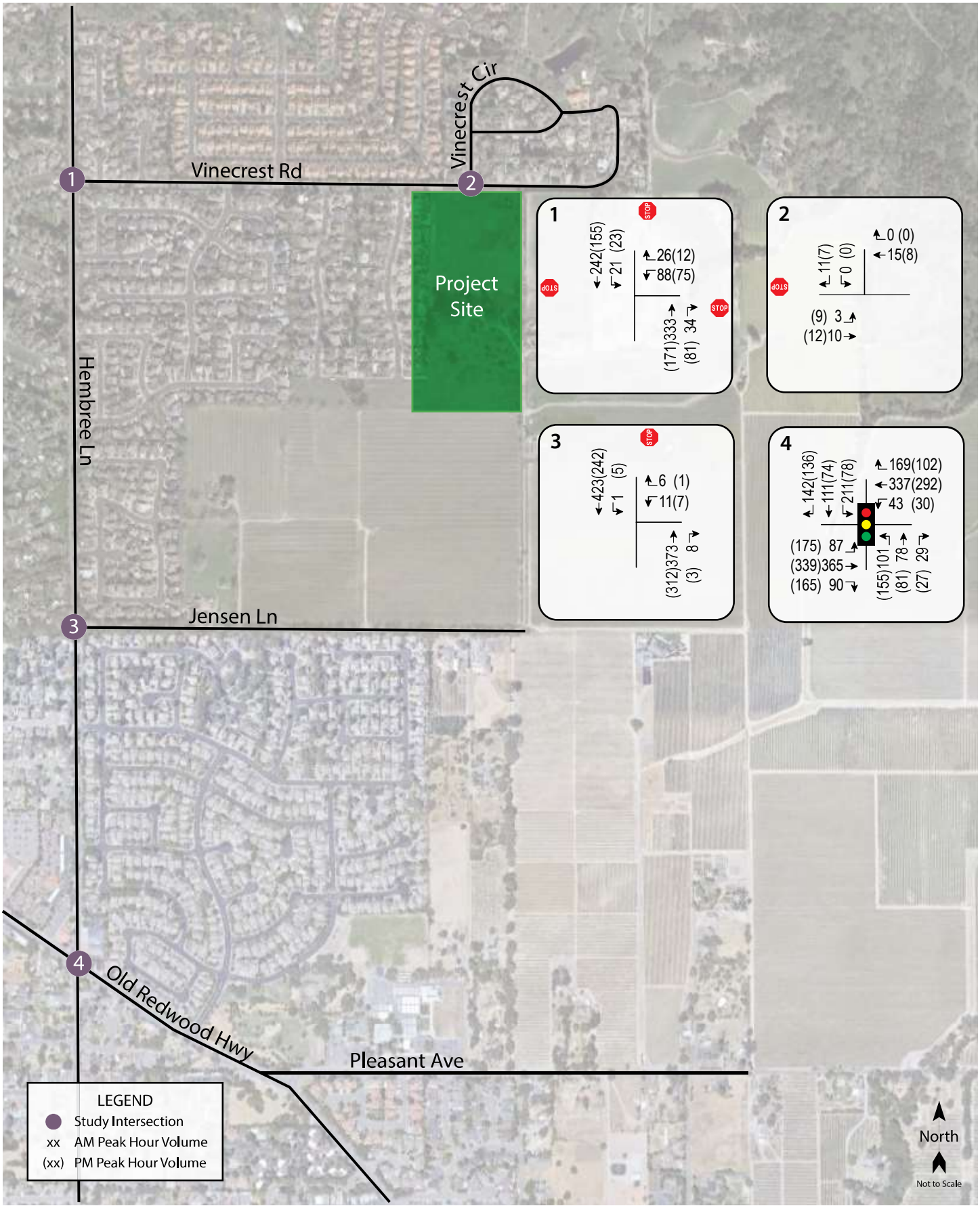
Table 8 – Existing Peak Hour Intersection Levels of Service

Study Intersection ***Approach***	**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. Hembree Ln/Vinecrest Rd	11.9	B	9.3	A
2. Vinecrest Rd/Vinecrest Cir	3.0	A	3.4	A
Southbound (Vinecrest Cir) Approach	*8.5*	*A*	*8.4*	*A*
3. Hembree Ln/Jensen Ln	0.3	A	0.3	A
Westbound (Jensen Ln) Approach	*15.8*	*C*	*13.2*	*B*
4. Hembree Ln/Old Redwood Hwy	19.0	B	17.3	B

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

Future Conditions

Segment volumes for the horizon year of 2040 were obtained from the SCTA regional travel demand model. The model's link-based volume projections were translated to turning movement volumes at the study intersections using the "Furness" method, which is an iterative process that employs existing turn movement data, existing link volumes, and future link volumes to project future turning movement volumes at intersections. Since the SCTA model generally includes collector and arterial roadways but not local streets, the projections were also adjusted to be consistent with current and planned local street circulation patterns.



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Traffic Impact Study for The Estates at Ross Ranch

Figure 3 – Existing Traffic Volumes

The Town of Windsor *General Plan* circulation map indicates completion of a future north-south rural lane between Vinecrest Road and Pleasant Avenue, which is referred to as the Jensen Lane extension (Eastside Connector). The new connection would include the existing north-south portion of Jensen Lane and would run along the eastern edge of the proposed Estates at Ross Ranch project. The street would not be anticipated to carry substantial volumes since it is on the far eastern edge of the Town and abutting agricultural lands on one side. It would, however, increase connectivity within and between neighborhoods, and provides an additional route for persons traveling to and from the south, reducing the amount of future traffic growth that would be added to Hembree Lane, Vinecrest Road and the existing east-west segment of Jensen Lane. An excerpt from the General Plan circulation map showing the Jensen Lane extension (Eastside Connector) is shown in Plate 2.

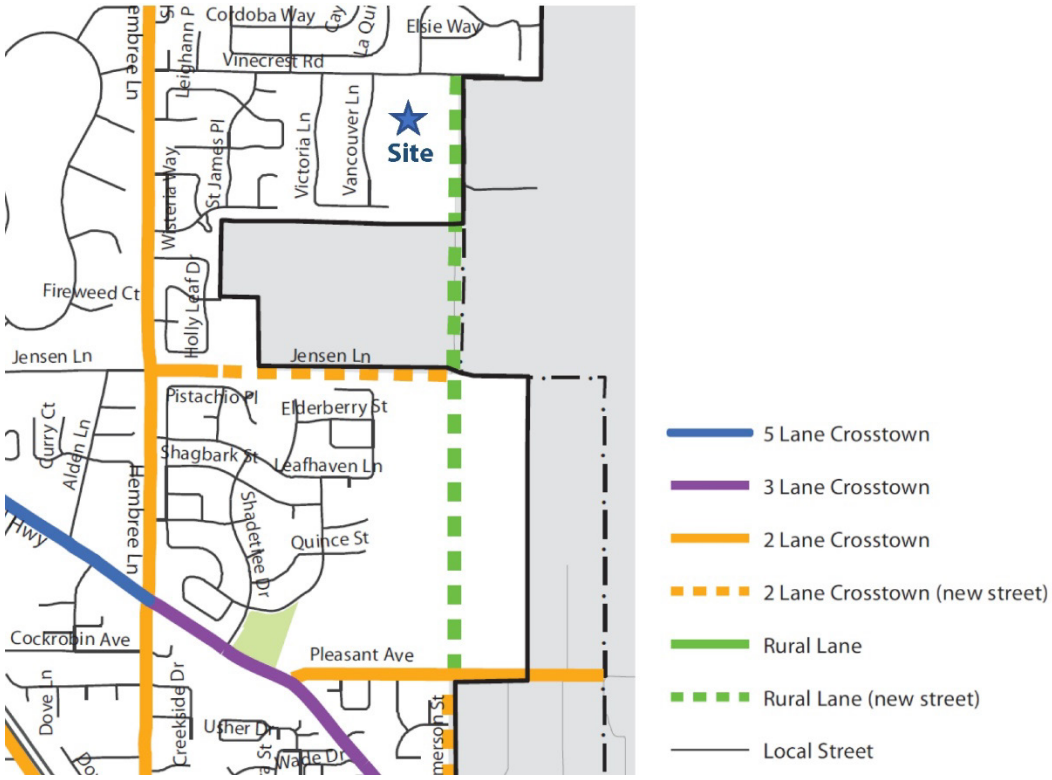
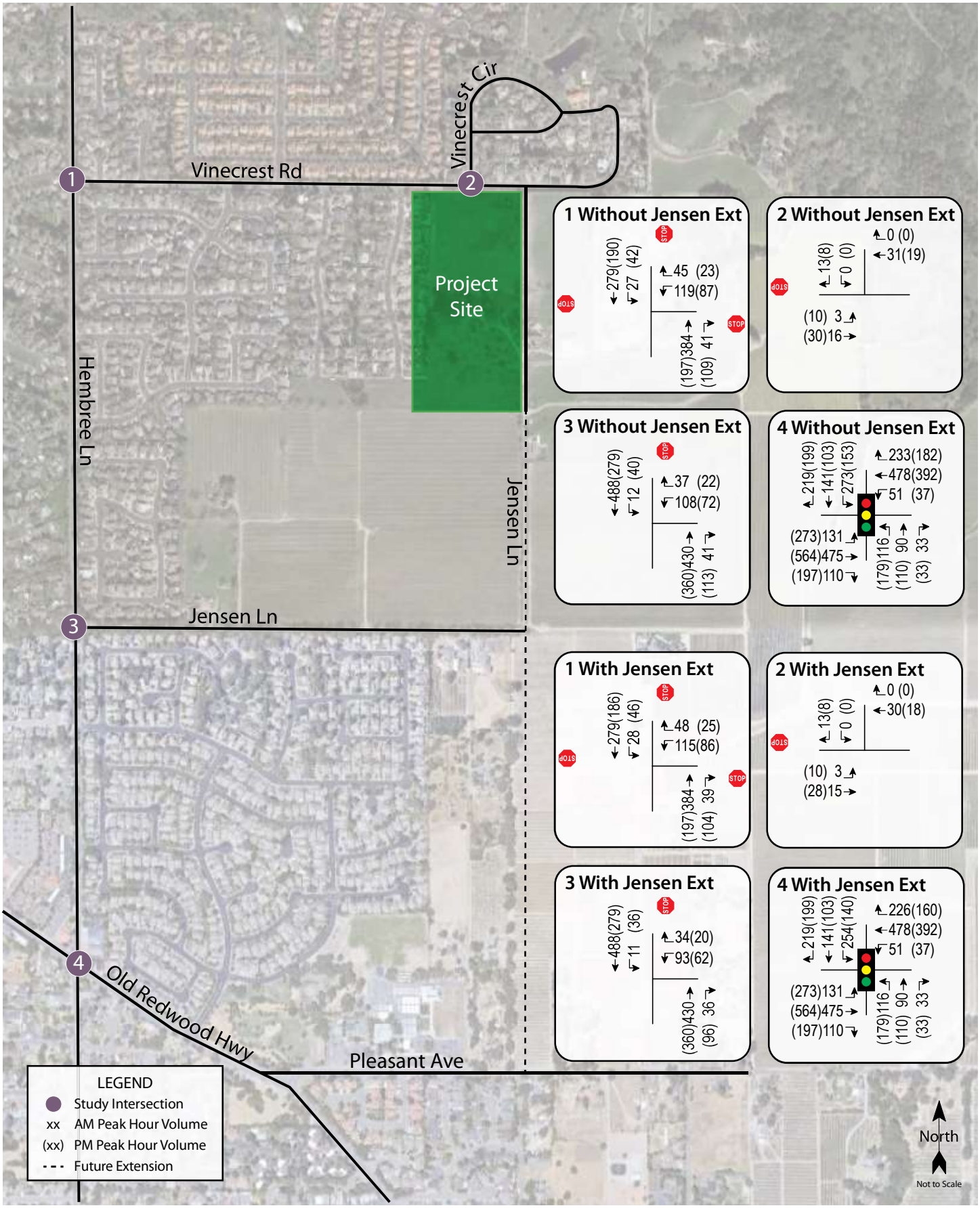


Plate 2 Excerpt from General Plan Circulation Map

Because the timing for completion of the Jensen Lane extension (Eastside Connector) is reliant on the future development projects that will construct it, as well as annexation from the County to the Town of Windsor, future conditions both without and with completion of the new linkage were analyzed.

Under the projected Future volumes, which do not include the proposed Estates at Ross Ranch project, three of the four study intersections are expected to operate acceptably both without and with completion of the Jensen Lane extension. Hembree Lane/Jensen Lane is projected to have unacceptable operation during the a.m. peak hour without the Jensen Lane extension. Future volumes are shown in Figure 4 and operating conditions are summarized in Table 9.



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Traffic Impact Study for The Estates at Ross Ranch

Figure 4 – Future Traffic Volumes

Table 9 – Future Peak Hour Intersection Levels of Service								
Study Intersection ***Approach***	**Without Jensen Extension**				**With Jensen Extension**			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1. Hembree Ln/Vinecrest Rd	15.7	C	10.5	B	15.6	C	10.5	B
2. Vinecrest Rd/Vinecrest Cir	2.1	A	2.1	A	2.2	A	2.2	A
Southbound (Vinecrest Cir) Approach	*8.5*	*A*	*8.5*	*A*	*8.5*	*A*	*8.4*	*A*
3. Hembree Ln/Jensen Ln	5.0	A	2.6	A	3.8	A	2.2	A
Westbound (Jensen Ln) Approach	***37.7***	***E***	*20.7*	*C*	*32.1*	*D*	*19.2*	*C*
4. Hembree Ln/Old Redwood Hwy	22.9	C	19.4	B	22.0	C	19.3	B

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

Project Conditions

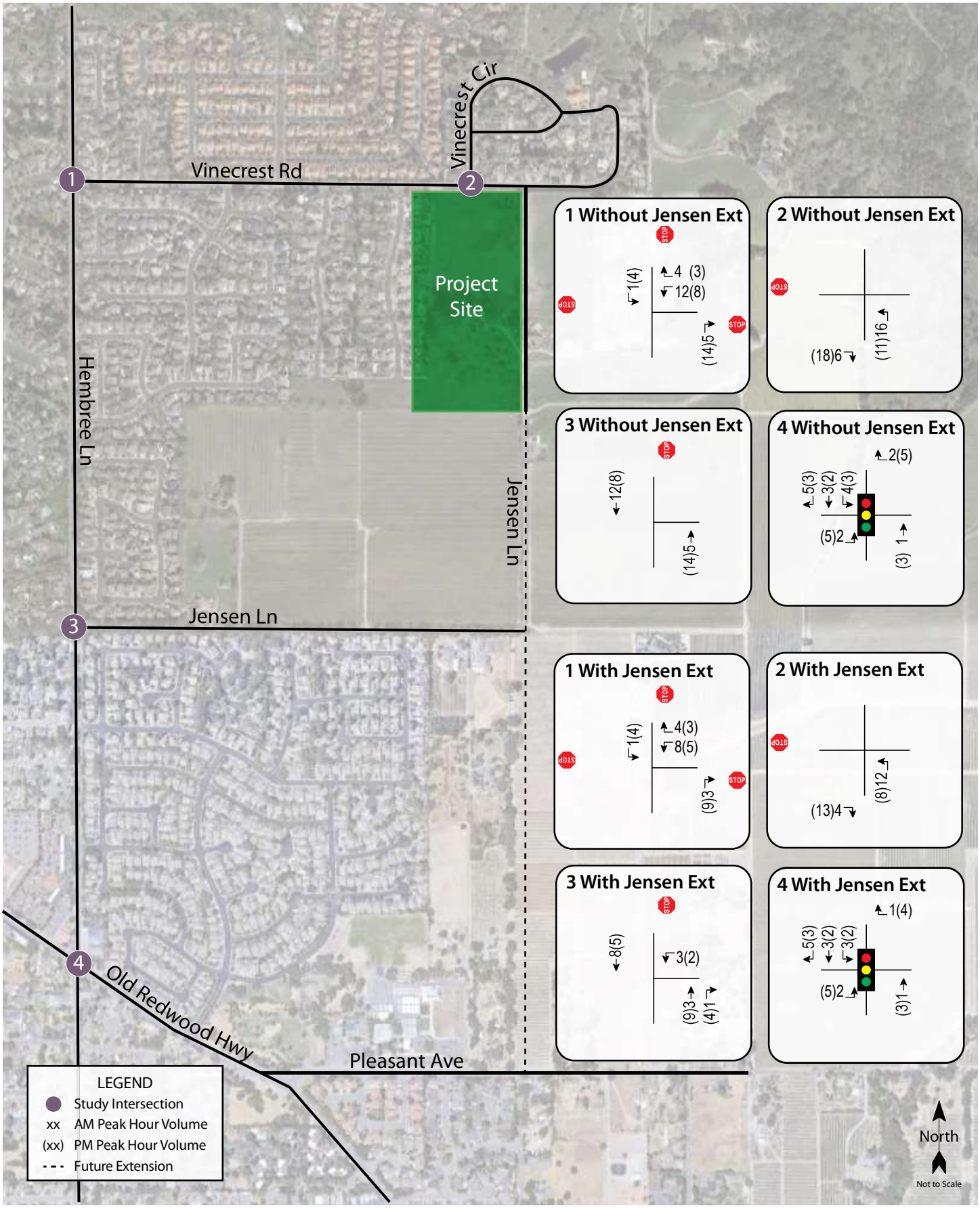
Existing plus Project Conditions

Upon the addition of project-related traffic to the Existing volumes, the study intersections are expected to operate acceptably. Project traffic volumes are shown in Figure 5 and Existing plus Project volumes are shown in Figure 6. These results are summarized in Table 10.

Table 10 – Existing and Existing plus Project Peak Hour Intersection Levels of Service								
Study Intersection ***Approach***	**Existing Conditions**				**Existing plus Project**			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1. Hembree Ln/Vinecrest Rd	11.9	B	9.3	A	12.3	B	9.6	A
2. Vinecrest Rd/Vinecrest Cir	3.0	A	3.4	A	4.3	A	3.4	A
NB (Project Street) Approach	-	-	-	-	*8.9*	*A*	*9.0*	*A*
SB (Vinecrest Cir) Approach	*8.5*	*A*	*8.4*	*A*	*8.5*	*A*	*8.4*	*A*
With Mini Roundabout	-	-	-	-	*2.9*	*A*	*2.9*	*A*
3. Hembree Ln/Jensen Ln	0.3	A	0.3	A	0.3	A	0.3	A
WB (Jensen Ln) Approach	*15.8*	*C*	*13.2*	*B*	*16.1*	*C*	*13.5*	*B*
4. Hembree Ln/Old Redwood Hwy	19.0	B	17.3	B	19.1	B	17.3	B

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

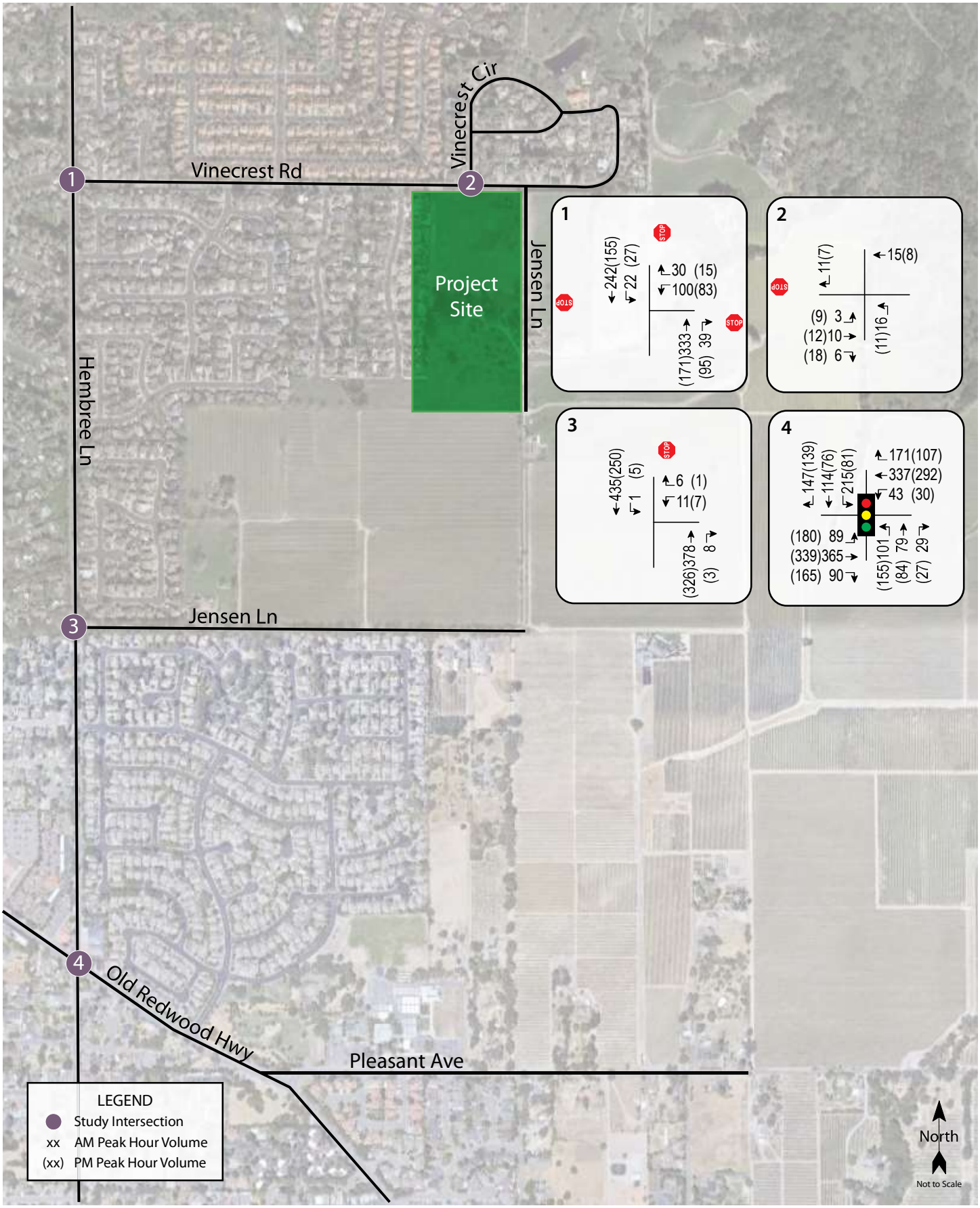
Finding – Under Existing plus Project conditions, the study intersections are expected to continue operating acceptably at the same Levels of Service upon the addition of project-generated traffic to existing volumes.



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Traffic Impact Study for The Estates at Ross Ranch

Figure 5 – Project Traffic Volumes



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Traffic Impact Study for The Estates at Ross Ranch

Figure 6 – Existing plus Project Traffic Volumes

W-Trans

Future plus Project Conditions

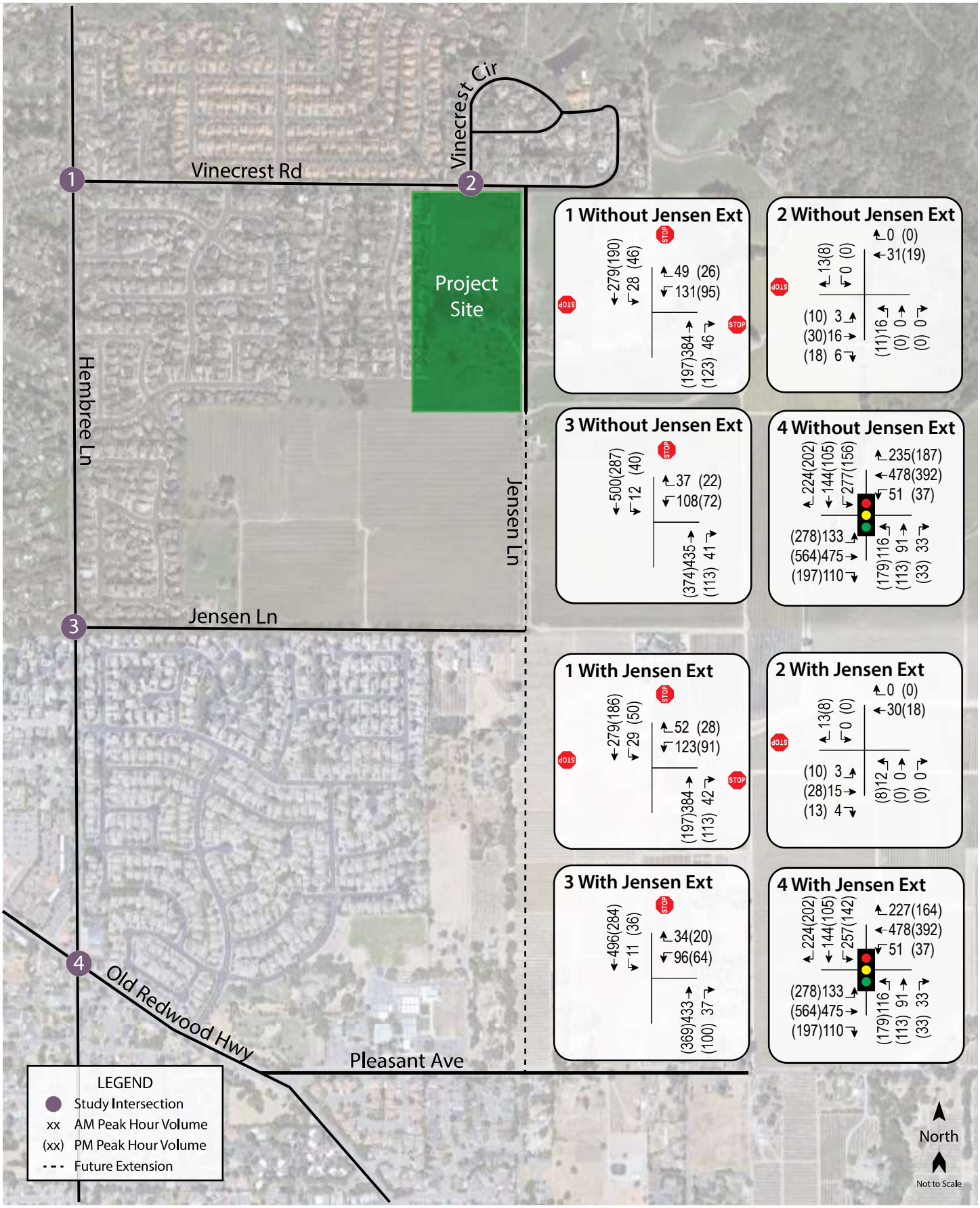
Upon the addition of project-generated traffic to the anticipated Future volumes, three of the four study intersections are expected to operate acceptably without the Jensen Lane extension (Eastside Connector), and at the same levels of service as would occur without the project. Operation on the westbound Jensen Lane approach at the Hembree Lane/Jensen Lane intersection is projected to be an unacceptable LOS E during the a.m. peak hour both with and without the project. The proposed project would increase the delay on this approach by approximately 1.8 seconds, which according to the Town's guidelines does not constitute an adverse operational effect. All four study intersections would operate acceptably with the Jensen Lane extension (Eastside Connector), with the same levels of service both with and without the project.

Future plus Project operation is summarized in Table 11 for conditions without the Jensen Lane extension, and in Table 12 for conditions with the extension. Future plus project traffic volumes are shown in Figure 7.

Table 11 – Future and Future plus Project Without Jensen Extension (Eastside Connector) Intersection Levels of Service

Study Intersection ***Approach***		**Future Conditions**				**Future plus Project**			
		AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1.	Hembree Ln/Vinecrest Rd	15.7	C	10.5	B	16.4	C	10.8	B
2.	Vinecrest Rd/Vinecrest Cir	2.1	A	2.1	A	3.3	A	2.5	A
	NB (Project Street) Approach	-	-	-	-	*9.1*	*A*	*9.2*	*A*
	SB (Vinecrest Cir) Approach	*8.5*	*A*	*8.5*	*A*	*8.5*	*A*	*8.5*	*A*
	With Mini Roundabout	-	-	-	-	*2.9*	*A*	*2.9*	*A*
3.	Hembree Ln/Jensen Ln	5.0	A	2.6	A	5.1	A	2.6	A
	WB (Jensen Ln) Approach	***37.7***	***E***	*20.7*	*C*	***39.5***	***E***	*21.6*	*C*
4.	Hembree Ln/Old Redwood Hwy	22.9	C	19.4	B	23.1	C	19.5	B

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



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Traffic Impact Study for The Estates at Ross Ranch

Figure 7 – Future plus Project Traffic Volumes

Table 12 – Future and Future plus Project with Jensen Extension (Eastside Connector) Intersection Levels of Service

	Study Intersection *Approach*	Future Conditions				Future plus Project			
		AM Peak		PM Peak		AM Peak		PM Peak	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1.	Hembree Ln/Vinecrest Rd	15.6	C	10.5	B	16.1	C	10.6	B
2.	Vinecrest Rd/Vinecrest Cir	2.2	A	2.2	A	3.1	A	2.5	A
	NB (Project Street) Approach	-	-	-	-	*9.1*	*A*	*9.1*	*A*
	SB (Vinecrest Cir) Approach	*8.5*	*A*	*8.4*	*A*	*8.5*	*A*	*8.4*	*A*
	With Mini Roundabout	-	-	-	-	*2.9*	*A*	*2.9*	*A*
3.	Hembree Ln/Jensen Ln	3.8	A	2.2	A	4.1	A	2.3	A
	WB (Jensen Ln) Approach	*32.1*	*D*	*19.2*	*C*	*34.0*	*D*	*19.9*	*C*
4.	Hembree Ln/Old Redwood Hwy	22.0	C	19.3	B	22.1	C	19.4	B

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

Finding – The study intersections are projected to continue operating acceptably in the future with the planned Jensen Lane extension (Eastside Connector), both with and without the addition of project-generated traffic.

Finding – Under future conditions without the Jensen Lane extension (Eastside Connector), unacceptable LOS E operation is projected to occur on the westbound Jensen Lane approach to Hembree Lane/Jensen Lane during the a.m. peak hour both with and without project traffic added, though the 1.8-second increase in delay attributable to the project would not be considered an adverse operational effect per the Town's guidelines.

Recommendation – No measures to improve traffic operation would be required.

Conclusions and Recommendations

Conclusions

- The proposed project is expected to generate approximately 292 vehicle trips per day, including 22 during the a.m. peak hour and 29 during the p.m. peak hour.
- Pedestrian connectivity to and from the project site would be adequate in the near-term and would improve in the future as developments to the south provide new sidewalk and pathway extensions. Pedestrian facilities would meet the requirements specified in the *Complete Street Design Guidelines*.
- Walking routes to the existing SCT bus stop on Hembree Lane would be adequate upon completion of sidewalk to be constructed as part of the project.
- Existing and planned bicycle facilities would provide adequate access for bicyclists traveling to and from the project.
- Existing public transit and school bus routes are adequate to accommodate the additional demand generated by the project, and existing bus stops accessible via continuous sidewalks are within an acceptable walking distance of the site. Transit facilities serving the project site are therefore considered to be adequate.
- The project is not expected to meet the applicable significance threshold for vehicle miles traveled.
- Even with incorporation of VMT reduction strategies and measures, the project would not be expected to fall below applicable VMT per capita thresholds and would therefore have a significant VMT impact.
- Sufficient sight distance is generally anticipated to be available at new intersections created by the project.
- Queuing in the southbound left-turn pocket at Hembree Lane/Old Redwood Highway exceeds the storage capacity under existing conditions and would continue to do so in the future both with and without the project, though such occurrences would be brief and are not anticipated to result in adverse safety or operational effects. Traffic generated by the proposed project would be responsible for increasing these queues by four to six feet, which per the Town's criteria (General Plan Policy M-3.17) does not constitute a significant impact.
- The proposed project would not be expected to result in an adverse safety condition on Vinecrest Road.
- The mini roundabout to be constructed by the proposed project would help to calm traffic on the Vinecrest Road corridor.
- The proposed roadway network, including connectivity to existing and future roads, would provide adequate emergency circulation and access from a transportation perspective.
- The proposed roadway configuration would accommodate multiple evacuation staging schemes that could be used in the case of approaching wildland fire threats.
- The project will be subject to review and approval by the Town's Fire Marshal; any requirements imposed by the Fire Marshal shall take precedence over the emergency access and circulation findings contained herein.

- Under Existing plus Project conditions including the addition of project-generated traffic, the study intersections are expected to continue operating acceptably at the same Levels of Service as Existing Conditions without the project.

- The study intersections are projected to continue operating acceptably in the future with the planned Jensen Lane extension (Eastside Connector), both with and without the addition of project-generated traffic.

- Under future conditions without the Jensen Lane extension (Eastside Connector) and without the project, unacceptable LOS E operation is projected to occur on the westbound Jensen Lane approach of Hembree Lane/Jensen Lane during the a.m. peak hour. With the addition of project-generated traffic, delays on this affected approach would increase by approximately 1.8-seconds, which would not be considered an adverse operational effect per the Town's guidelines.

Recommendations

- To the degree feasible, the project should Incorporate on-site affordable housing units (potentially including ADUs) for individuals and families in lower income categories.

- The project should be required to construct an enhanced pedestrian crossing including refuge median on the west leg of the Vinecrest Road/Foothill Drive intersection.

- A gate should be installed at the southern terminus of the Jensen Lane segment to be constructed by the project, preventing vehicular traffic from the project and points northward from using the currently unimproved segment of Jensen Lane to the south. The gate would be removed in the future once Jensen Lane is improved to public street standards. Emergency responders shall be able to unlock the interim gate as needed.

- Sight distance requirements should be confirmed at the project intersections during the Town's review of landscaping plans.

- Measures identified to reduce VMT impacts, including construction of a mini roundabout at Vinecrest Road/Vinecrest Circle-Portland Way intersection and a pedestrian crossing with median refuge at Vinecrest Road/Foothill Drive, would also serve as an effective neighborhood traffic calming strategy and should be implemented.

Study Participants and References

Study Participants

Principal in Charge	Zachary Matley, AICP
Assistant Planner	Jade Kim
Graphics	Cameron Wong
Editing/Formatting	Alex Scrobonia
Quality Control	Dalene J. Whitlock, PE, PTOE

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Appendix A

Collision Rate Calculations

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Intersection Collision Rate Worksheet

Traffic Impact Study for The Estates at Ross Ranch

Intersection # 1: Hembree Lane & Vinecrest Road
Date of Count: Thursday, September 30, 2021

Number of Collisions: 1
Number of Injuries: 1
Number of Fatalities: 0
Average Daily Traffic (ADT): 5200
Start Date: August 1, 2016
End Date: July 30, 2021
Number of Years: 5

Intersection Type: Tee
Control Type: 4 Way Stop
Area: Urban

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

$$\text{Collision Rate} = \frac{1 \times 1{,}000{,}000}{5{,}200 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.11 c/mve**	**0.0%**	**100.0%**
Statewide Average*	**0.07 c/mve**	**1.1%**	**38.6%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2018 Collision Data on California State Highways, Caltrans

Intersection # 2: Vinecrest Road & Vinecrest Circle
Date of Count: Thursday, September 30, 2021

Number of Collisions: 0
Number of Injuries: 0
Number of Fatalities: 0
Average Daily Traffic (ADT): 360
Start Date: August 1, 2016
End Date: July 30, 2021
Number of Years: 5

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

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

$$\text{Collision Rate} = \frac{0 \times 1{,}000{,}000}{360 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.00 c/mve**	**0.0%**	**0.0%**
Statewide Average*	**0.09 c/mve**	**1.2%**	**46.9%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2018 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Worksheet

Traffic Impact Study for The Estates at Ross Ranch

Intersection # 3: Hembree Lane & Jensen Lane
Date of Count: Thursday, September 30, 2021

Number of Collisions: 0
Number of Injuries: 0
Number of Fatalities: 0
Average Daily Traffic (ADT): 5700
Start Date: August 1, 2016
End Date: July 30, 2021
Number of Years: 5

Intersection Type: Tee
Control Type: 4 Way Stop
Area: Urban

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

$$\text{Collision Rate} = \frac{0 \times 1{,}000{,}000}{5{,}700 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.00 c/mve**	**0.0%**	**0.0%**
Statewide Average*	**0.07 c/mve**	**1.1%**	**38.6%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2018 Collision Data on California State Highways, Caltrans

Intersection # 4: Old Redwood Highway & Hembree Lane
Date of Count: Thursday, September 30, 2021

Number of Collisions: 8
Number of Injuries: 3
Number of Fatalities: 0
Average Daily Traffic (ADT): 16500
Start Date: August 1, 2016
End Date: July 30, 2021
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Signals
Area: Urban

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

$$\text{Collision Rate} = \frac{8 \times 1{,}000{,}000}{16{,}500 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.27 c/mve**	**0.0%**	**37.5%**
Statewide Average*	**0.24 c/mve**	**0.5%**	**46.9%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2018 Collision Data on California State Highways, Caltrans

Appendix B

Queuing Calculations

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Queuing and Blocking Report
Baseline
10/26/2021

Intersection: 4: Hembree Lane & Old Redwood Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	T	R
Maximum Queue (ft)	49	116	72	31	85	107	77	78	146	76	63
Average Queue (ft)	21	63	20	8	46	44	40	44	78	42	37
95th Queue (ft)	51	125	76	31	95	108	80	82	153	84	63
Link Distance (ft)	948	948	948	285	285	285	902	902	2272	2272	2272
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

Queuing and Blocking Report
Baseline
10/26/2021

Intersection: 4: Hembree Lane & Old Redwood Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	T	R
Maximum Queue (ft)	77	100	68	17	80	79	104	81	55	70	52
Average Queue (ft)	35	44	20	6	38	31	56	44	23	29	33
95th Queue (ft)	77	98	63	24	79	79	110	87	62	70	56
Link Distance (ft)	948	948	948	285	285	285	902	902	2272	2272	2272
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

Queuing and Blocking Report
Baseline
04/13/2022

Intersection: 4: Hembree Lane & Old Redwood Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	T	R
Maximum Queue (ft)	60	118	85	34	119	102	78	101	146	98	66
Average Queue (ft)	27	58	19	9	64	51	38	56	82	50	38
95th Queue (ft)	67	114	69	34	123	110	82	108	157	102	66
Link Distance (ft)		954	954		285	285	901			291	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	195			200				160	110		120
Storage Blk Time (%)								1	3	0	
Queuing Penalty (veh)								1	9	2	

Queuing and Blocking Report
Baseline
10/26/2021

Intersection: 4: Hembree Lane & Old Redwood Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	T	R
Maximum Queue (ft)	73	96	69	53	106	81	104	89	65	76	58
Average Queue (ft)	38	53	18	13	65	38	54	47	29	33	37
95th Queue (ft)	77	108	61	50	112	91	112	94	71	81	62
Link Distance (ft)	951	951	951	286	286	286	902	902	1046	1046	1046
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

Queuing and Blocking Report
Baseline
10/26/2021

Intersection: 4: Hembree Lane & Old Redwood Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	T	R
Maximum Queue (ft)	70	154	127	40	148	174	113	94	215	102	98
Average Queue (ft)	35	97	51	14	85	93	62	60	136	55	57
95th Queue (ft)	75	166	134	40	155	177	122	113	252	101	99
Link Distance (ft)	948	948	948	285	285	285	902	902	2272	2272	2272
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

Queuing and Blocking Report
Baseline
10/26/2021

Intersection: 4: Hembree Lane & Old Redwood Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	T	R
Maximum Queue (ft)	152	166	130	26	124	147	150	120	119	100	66
Average Queue (ft)	95	98	56	8	77	83	82	73	56	49	47
95th Queue (ft)	164	176	136	28	131	152	157	126	123	103	74
Link Distance (ft)	948	948	948	285	285	285	902	902	2272	2272	2272
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

Queuing and Blocking Report
Baseline
04/13/2022

Intersection: 4: Hembree Lane & Old Redwood Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	T	R
Maximum Queue (ft)	88	155	134	35	137	170	100	121	225	118	89
Average Queue (ft)	39	88	50	11	86	95	51	65	135	58	46
95th Queue (ft)	87	159	134	42	141	173	100	119	258	116	82
Link Distance (ft)	948	948	948	285	285	285	902	902	2272	2272	2272
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

Queuing and Blocking Report
Mitigated FYA
04/13/2022

Intersection: 4: Hembree Lane & Old Redwood Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	T	R
Maximum Queue (ft)	75	143	130	32	162	172	81	123	170	105	85
Average Queue (ft)	38	82	39	12	85	97	39	66	90	54	48
95th Queue (ft)	76	151	111	32	157	175	80	120	181	108	79
Link Distance (ft)	948	948	948	285	285	285	902	902	2272	2272	2272
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

Intersection: 4: Hembree Lane & Old Redwood Highway

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	T	R
Maximum Queue (ft)	177	170	140	27	116	134	154	122	124	100	77
Average Queue (ft)	91	110	68	10	77	79	82	72	58	52	48
95th Queue (ft)	166	188	145	33	129	139	161	131	129	104	82
Link Distance (ft)	948	948	948	285	285	285	902	902	2272	2272	2272
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

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Appendix C

Intersection Level of Service Calculations

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Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	88	26	333	34	21	242
Future Vol, veh/h	88	26	333	34	21	242
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	102	30	387	40	24	281
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	10.1	13.1	11.1
HCM LOS	B	B	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	77%	8%
Vol Thru, %	91%	0%	92%
Vol Right, %	9%	23%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	367	114	263
LT Vol	0	88	21
Through Vol	333	0	242
RT Vol	34	26	0
Lane Flow Rate	427	133	306
Geometry Grp	1	1	1
Degree of Util (X)	0.546	0.205	0.407
Departure Headway (Hd)	4.604	5.575	4.796
Convergence, Y/N	Yes	Yes	Yes
Cap	781	638	746
Service Time	2.657	3.662	2.857
HCM Lane V/C Ratio	0.547	0.208	0.41
HCM Control Delay	13.1	10.1	11.1
HCM Lane LOS	B	B	B
HCM 95th-tile Q	3.4	0.8	2

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	10	0	0	15	0	0	0	0	0	0	11
Future Vol, veh/h	3	10	0	0	15	0	0	0	0	0	0	11
Conflicting Peds, #/hr	0	0	1	0	0	7	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	12	0	0	18	0	0	0	0	0	0	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	25	0	0	13	0	0	46	46	13	45	46	25
Stage 1	-	-	-	-	-	-	21	21	-	25	25	-
Stage 2	-	-	-	-	-	-	25	25	-	20	21	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1589	-	-	1606	-	-	955	846	1067	957	846	1051
Stage 1	-	-	-	-	-	-	998	878	-	993	874	-
Stage 2	-	-	-	-	-	-	993	874	-	999	878	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1578	-	-	1604	-	-	940	837	1066	948	837	1044
Mov Cap-2 Maneuver	-	-	-	-	-	-	940	837	-	948	837	-
Stage 1	-	-	-	-	-	-	994	874	-	983	868	-
Stage 2	-	-	-	-	-	-	981	868	-	996	874	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	0	0	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1578	-	-	1604	-	-	1044
HCM Lane V/C Ratio	-	0.002	-	-	-	-	-	0.012
HCM Control Delay (s)	0	7.3	0	-	0	-	-	8.5
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	6	373	8	1	423
Future Vol, veh/h	11	6	373	8	1	423
Conflicting Peds, #/hr	0	0	0	6	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	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	7	439	9	1	498

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	950	450	0	0	454	0
Stage 1	450	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	289	609	-	-	1107	-
Stage 1	642	-	-	-	-	-
Stage 2	609	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	287	606	-	-	1101	-
Mov Cap-2 Maneuver	287	-	-	-	-	-
Stage 1	638	-	-	-	-	-
Stage 2	608	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.8	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 352	1101	-
HCM Lane V/C Ratio	-	- 0.057	0.001	-
HCM Control Delay (s)	-	- 15.8	8.3	0
HCM Lane LOS	-	- C	A	A
HCM 95th %tile Q(veh)	-	- 0.2	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	365	90	43	337	169	101	78	29	211	111	142
Future Volume (veh/h)	87	365	90	43	337	169	101	78	29	211	111	142
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.96	1.00		0.96	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	102	429	68	51	396	158	119	92	20	248	131	74
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	360	780	123	363	557	219	280	233	51	305	322	268
Arrive On Green	0.09	0.26	0.26	0.06	0.23	0.23	0.16	0.16	0.16	0.17	0.17	0.17
Sat Flow, veh/h	1781	3058	481	1781	2461	966	1781	1475	321	1781	1870	1556
Grp Volume(v), veh/h	102	248	249	51	284	270	119	0	112	248	131	74
Grp Sat Flow(s),veh/h/ln	1781	1777	1762	1781	1777	1650	1781	0	1795	1781	1870	1556
Q Serve(g_s), s	2.2	6.3	6.4	1.1	7.7	7.9	3.2	0.0	2.9	7.0	3.3	2.2
Cycle Q Clear(g_c), s	2.2	6.3	6.4	1.1	7.7	7.9	3.2	0.0	2.9	7.0	3.3	2.2
Prop In Lane	1.00		0.27	1.00		0.59	1.00		0.18	1.00		1.00
Lane Grp Cap(c), veh/h	360	453	449	363	402	374	280	0	284	305	322	268
V/C Ratio(X)	0.28	0.55	0.55	0.14	0.71	0.72	0.42	0.00	0.39	0.81	0.41	0.28
Avail Cap(c_a), veh/h	713	1158	1149	665	1043	969	681	0	1068	511	919	764
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.7	16.9	16.9	14.0	18.6	18.7	19.9	0.0	19.8	20.9	19.3	18.8
Incr Delay (d2), s/veh	0.2	0.4	0.4	0.1	0.9	1.0	0.4	0.0	0.3	2.0	0.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	2.3	2.3	0.4	2.8	2.7	1.2	0.0	1.1	2.7	1.3	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.9	17.3	17.3	14.0	19.5	19.7	20.3	0.0	20.1	22.9	19.6	19.0
LnGrp LOS	B	B	B	B	B	B	C	A	C	C	B	B
Approach Vol, veh/h		599			605			231			453	
Approach Delay, s/veh		16.7			19.1			20.2			21.3	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.1	18.6	12.2	14.3	8.6	17.1	12.9	13.6
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	3.1	8.4	5.2	5.3	4.2	9.9	9.0	4.9
Green Ext Time (p_c), s	0.0	0.5	0.1	0.2	0.1	0.6	0.2	0.1

Intersection Summary	
HCM 6th Ctrl Delay	19.0
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	9.3
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	75	12	171	81	23	155
Future Vol, veh/h	75	12	171	81	23	155
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	88	14	201	95	27	182
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9	9.5	9.2
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	86%	13%
Vol Thru, %	68%	0%	87%
Vol Right, %	32%	14%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	252	87	178
LT Vol	0	75	23
Through Vol	171	0	155
RT Vol	81	12	0
Lane Flow Rate	296	102	209
Geometry Grp	1	1	1
Degree of Util (X)	0.349	0.146	0.264
Departure Headway (Hd)	4.239	5.119	4.532
Convergence, Y/N	Yes	Yes	Yes
Cap	848	699	792
Service Time	2.264	3.159	2.56
HCM Lane V/C Ratio	0.349	0.146	0.264
HCM Control Delay	9.5	9	9.2
HCM Lane LOS	A	A	A
HCM 95th-tile Q	1.6	0.5	1.1

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	12	0	0	8	0	0	0	0	0	0	7
Future Vol, veh/h	9	12	0	0	8	0	0	0	0	0	0	7
Conflicting Peds, #/hr	0	0	1	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	14	0	0	9	0	0	0	0	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	10	0	0	15	0	0	50	47	15	46	47	10
Stage 1	-	-	-	-	-	-	37	37	-	10	10	-
Stage 2	-	-	-	-	-	-	13	10	-	36	37	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1610	-	-	1603	-	-	950	845	1065	955	845	1071
Stage 1	-	-	-	-	-	-	978	864	-	1011	887	-
Stage 2	-	-	-	-	-	-	1007	887	-	980	864	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1608	-	-	1601	-	-	937	837	1064	949	837	1070
Mov Cap-2 Maneuver	-	-	-	-	-	-	937	837	-	949	837	-
Stage 1	-	-	-	-	-	-	970	857	-	1003	886	-
Stage 2	-	-	-	-	-	-	999	886	-	973	857	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.1	0	0	8.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1608	-	-	1601	-	-	1070
HCM Lane V/C Ratio	-	0.007	-	-	-	-	-	0.008
HCM Control Delay (s)	0	7.3	0	-	0	-	-	8.4
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	1	312	3	5	242
Future Vol, veh/h	7	1	312	3	5	242
Conflicting Peds, #/hr	0	0	0	6	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	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	1	355	3	6	275

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	650	363	0	0	364	0
Stage 1	363	-	-	-	-	-
Stage 2	287	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	434	682	-	-	1195	-
Stage 1	704	-	-	-	-	-
Stage 2	762	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	429	678	-	-	1188	-
Mov Cap-2 Maneuver	429	-	-	-	-	-
Stage 1	700	-	-	-	-	-
Stage 2	757	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	450	1188	-
HCM Lane V/C Ratio	-	-	0.02	0.005	-
HCM Control Delay (s)	-	-	13.2	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	175	339	165	30	292	102	155	81	27	78	74	136
Future Volume (veh/h)	175	339	165	30	292	102	155	81	27	78	74	136
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	0.99		0.95	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	184	357	132	32	307	92	163	85	10	82	78	52
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	427	655	238	344	511	150	322	323	38	219	261	217
Arrive On Green	0.11	0.26	0.26	0.04	0.19	0.19	0.18	0.20	0.20	0.12	0.14	0.14
Sat Flow, veh/h	1781	2525	916	1781	2677	784	1781	1637	193	1781	1870	1554
Grp Volume(v), veh/h	184	249	240	32	201	198	163	0	95	82	78	52
Grp Sat Flow(s),veh/h/ln	1781	1777	1665	1781	1777	1684	1781	0	1830	1781	1870	1554
Q Serve(g_s), s	3.8	6.0	6.2	0.7	5.1	5.3	4.1	0.0	2.2	2.1	1.8	1.5
Cycle Q Clear(g_c), s	3.8	6.0	6.2	0.7	5.1	5.3	4.1	0.0	2.2	2.1	1.8	1.5
Prop In Lane	1.00		0.55	1.00		0.47	1.00		0.11	1.00		1.00
Lane Grp Cap(c), veh/h	427	461	432	344	339	321	322	0	361	219	261	217
V/C Ratio(X)	0.43	0.54	0.56	0.09	0.59	0.62	0.51	0.00	0.26	0.37	0.30	0.24
Avail Cap(c_a), veh/h	769	1227	1150	700	1105	1048	722	0	1153	541	974	809
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.9	15.7	15.8	14.8	18.2	18.3	18.2	0.0	16.8	19.9	19.1	18.9
Incr Delay (d2), s/veh	0.3	0.4	0.4	0.0	0.6	0.7	0.5	0.0	0.1	0.4	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	2.1	2.0	0.2	1.9	1.9	1.5	0.0	0.8	0.8	0.7	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.1	16.1	16.2	14.9	18.8	19.0	18.7	0.0	16.9	20.3	19.3	19.1
LnGrp LOS	B	B	B	B	B	B	B	A	B	C	B	B
Approach Vol, veh/h		673			431			258			212	
Approach Delay, s/veh		15.3			18.6			18.0			19.6	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.1	18.1	12.9	12.2	9.5	14.7	10.1	15.0
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	2.7	8.2	6.1	3.8	5.8	7.3	4.1	4.2
Green Ext Time (p_c), s	0.0	0.5	0.2	0.1	0.2	0.4	0.1	0.1

Intersection Summary		
HCM 6th Ctrl Delay	17.3	
HCM 6th LOS	B	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	12.3
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	100	30	333	39	22	242
Future Vol, veh/h	100	30	333	39	22	242
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	116	35	387	45	26	281
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	10.4	13.6	11.4
HCM LOS	B	B	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	77%	8%
Vol Thru, %	90%	0%	92%
Vol Right, %	10%	23%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	372	130	264
LT Vol	0	100	22
Through Vol	333	0	242
RT Vol	39	30	0
Lane Flow Rate	433	151	307
Geometry Grp	1	1	1
Degree of Util (X)	0.56	0.235	0.415
Departure Headway (Hd)	4.659	5.597	4.866
Convergence, Y/N	Yes	Yes	Yes
Cap	770	635	734
Service Time	2.721	3.696	2.937
HCM Lane V/C Ratio	0.562	0.238	0.418
HCM Control Delay	13.6	10.4	11.4
HCM Lane LOS	B	B	B
HCM 95th-tile Q	3.5	0.9	2

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	10	6	0	15	0	16	0	0	0	0	11
Future Vol, veh/h	3	10	6	0	15	0	16	0	0	0	0	11
Conflicting Peds, #/hr	0	0	1	0	0	7	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	12	7	0	18	0	19	0	0	0	0	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	25	0	0	20	0	0	50	50	17	49	53	25
Stage 1	-	-	-	-	-	-	25	25	-	25	25	-
Stage 2	-	-	-	-	-	-	25	25	-	24	28	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1589	-	-	1596	-	-	950	841	1062	951	838	1051
Stage 1	-	-	-	-	-	-	993	874	-	993	874	-
Stage 2	-	-	-	-	-	-	993	874	-	994	872	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1578	-	-	1594	-	-	935	832	1061	942	829	1044
Mov Cap-2 Maneuver	-	-	-	-	-	-	935	832	-	942	829	-
Stage 1	-	-	-	-	-	-	989	871	-	983	868	-
Stage 2	-	-	-	-	-	-	981	868	-	991	869	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.2	0	8.9	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	935	1578	-	-	1594	-	-	1044
HCM Lane V/C Ratio	0.02	0.002	-	-	-	-	-	0.012
HCM Control Delay (s)	8.9	7.3	0	-	0	-	-	8.5
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	6	378	8	1	435
Future Vol, veh/h	11	6	378	8	1	435
Conflicting Peds, #/hr	0	0	0	6	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	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	7	445	9	1	512

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	970	456	0	0	460	0
Stage 1	456	-	-	-	-	-
Stage 2	514	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	281	604	-	-	1101	-
Stage 1	638	-	-	-	-	-
Stage 2	600	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	279	601	-	-	1095	-
Mov Cap-2 Maneuver	279	-	-	-	-	-
Stage 1	634	-	-	-	-	-
Stage 2	599	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.1	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	344	1095	-
HCM Lane V/C Ratio	-	-	0.058	0.001	-
HCM Control Delay (s)	-	-	16.1	8.3	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	89	365	90	43	337	171	101	79	29	215	114	147
Future Volume (veh/h)	89	365	90	43	337	171	101	79	29	215	114	147
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.96	1.00		0.96	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	105	429	68	51	396	160	119	93	20	253	134	80
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	359	783	123	363	555	221	279	232	50	310	327	272
Arrive On Green	0.09	0.26	0.26	0.06	0.23	0.23	0.16	0.16	0.16	0.17	0.17	0.17
Sat Flow, veh/h	1781	3058	481	1781	2451	975	1781	1478	318	1781	1870	1556
Grp Volume(v), veh/h	105	248	249	51	285	271	119	0	113	253	134	80
Grp Sat Flow(s),veh/h/ln	1781	1777	1762	1781	1777	1648	1781	0	1796	1781	1870	1556
Q Serve(g_s), s	2.3	6.4	6.5	1.1	7.8	8.0	3.2	0.0	3.0	7.2	3.4	2.4
Cycle Q Clear(g_c), s	2.3	6.4	6.5	1.1	7.8	8.0	3.2	0.0	3.0	7.2	3.4	2.4
Prop In Lane	1.00		0.27	1.00		0.59	1.00		0.18	1.00		1.00
Lane Grp Cap(c), veh/h	359	455	451	363	403	374	279	0	282	310	327	272
V/C Ratio(X)	0.29	0.54	0.55	0.14	0.71	0.72	0.43	0.00	0.40	0.82	0.41	0.29
Avail Cap(c_a), veh/h	707	1150	1140	662	1035	960	676	0	1060	507	912	759
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.8	16.9	17.0	14.1	18.8	18.9	20.1	0.0	20.0	21.0	19.3	18.9
Incr Delay (d2), s/veh	0.2	0.4	0.4	0.1	0.9	1.0	0.4	0.0	0.3	2.0	0.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	2.3	2.3	0.4	2.9	2.8	1.2	0.0	1.1	2.8	1.3	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.0	17.3	17.4	14.1	19.6	19.9	20.5	0.0	20.3	23.0	19.6	19.1
LnGrp LOS	B	B	B	B	B	B	C	A	C	C	B	B
Approach Vol, veh/h		602			607			232			467	
Approach Delay, s/veh		16.8			19.3			20.4			21.4	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.2	18.8	12.2	14.5	8.7	17.2	13.2	13.6
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	3.1	8.5	5.2	5.4	4.3	10.0	9.2	5.0
Green Ext Time (p_c), s	0.0	0.5	0.1	0.2	0.1	0.6	0.2	0.1

Intersection Summary	
HCM 6th Ctrl Delay	19.1
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	9.6
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	83	15	171	95	27	155
Future Vol, veh/h	83	15	171	95	27	155
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	98	18	201	112	32	182
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9.2	9.8	9.4
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	85%	15%
Vol Thru, %	64%	0%	85%
Vol Right, %	36%	15%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	266	98	182
LT Vol	0	83	27
Through Vol	171	0	155
RT Vol	95	15	0
Lane Flow Rate	313	115	214
Geometry Grp	1	1	1
Degree of Util (X)	0.371	0.165	0.273
Departure Headway (Hd)	4.264	5.154	4.593
Convergence, Y/N	Yes	Yes	Yes
Cap	845	694	782
Service Time	2.291	3.201	2.624
HCM Lane V/C Ratio	0.37	0.166	0.274
HCM Control Delay	9.8	9.2	9.4
HCM Lane LOS	A	A	A
HCM 95th-tile Q	1.7	0.6	1.1

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	12	18	0	8	0	11	0	0	0	0	7
Future Vol, veh/h	9	12	18	0	8	0	11	0	0	0	0	7
Conflicting Peds, #/hr	0	0	1	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	14	21	0	9	0	13	0	0	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	10	0	0	36	0	0	61	58	26	57	68	10
Stage 1	-	-	-	-	-	-	48	48	-	10	10	-
Stage 2	-	-	-	-	-	-	13	10	-	47	58	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1610	-	-	1575	-	-	934	833	1050	940	823	1071
Stage 1	-	-	-	-	-	-	965	855	-	1011	887	-
Stage 2	-	-	-	-	-	-	1007	887	-	967	847	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1608	-	-	1574	-	-	921	826	1049	934	816	1070
Mov Cap-2 Maneuver	-	-	-	-	-	-	921	826	-	934	816	-
Stage 1	-	-	-	-	-	-	957	848	-	1003	886	-
Stage 2	-	-	-	-	-	-	999	886	-	960	840	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	0	9	8.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	921	1608	-	-	1574	-	-	1070
HCM Lane V/C Ratio	0.014	0.007	-	-	-	-	-	0.008
HCM Control Delay (s)	9	7.3	0	-	0	-	-	8.4
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	1	326	3	5	250
Future Vol, veh/h	7	1	326	3	5	250
Conflicting Peds, #/hr	0	0	0	6	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	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	1	370	3	6	284

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	674	378	0	0	379	0
Stage 1	378	-	-	-	-	-
Stage 2	296	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	420	669	-	-	1179	-
Stage 1	693	-	-	-	-	-
Stage 2	755	-	-	-	-	-
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	415	665	-	-	1172	-
Mov Cap-2 Maneuver	415	-	-	-	-	-
Stage 1	689	-	-	-	-	-
Stage 2	750	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.5	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	435	1172	-
HCM Lane V/C Ratio	-	-	0.021	0.005	-
HCM Control Delay (s)	-	-	13.5	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	339	165	30	292	107	155	84	27	81	76	139
Future Volume (veh/h)	180	339	165	30	292	107	155	84	27	81	76	139
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	0.99		0.95	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	189	357	132	32	307	98	163	88	10	85	80	55
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	427	659	239	345	501	156	322	320	36	223	261	217
Arrive On Green	0.11	0.26	0.26	0.04	0.19	0.19	0.18	0.19	0.19	0.13	0.14	0.14
Sat Flow, veh/h	1781	2526	916	1781	2632	820	1781	1644	187	1781	1870	1554
Grp Volume(v), veh/h	189	249	240	32	205	200	163	0	98	85	80	55
Grp Sat Flow(s),veh/h/ln	1781	1777	1665	1781	1777	1676	1781	0	1831	1781	1870	1554
Q Serve(g_s), s	3.9	6.0	6.2	0.7	5.2	5.4	4.1	0.0	2.3	2.2	1.9	1.6
Cycle Q Clear(g_c), s	3.9	6.0	6.2	0.7	5.2	5.4	4.1	0.0	2.3	2.2	1.9	1.6
Prop In Lane	1.00		0.55	1.00		0.49	1.00		0.10	1.00		1.00
Lane Grp Cap(c), veh/h	427	464	434	345	338	319	322	0	357	223	261	217
V/C Ratio(X)	0.44	0.54	0.55	0.09	0.61	0.63	0.51	0.00	0.27	0.38	0.31	0.25
Avail Cap(c_a), veh/h	764	1224	1147	700	1102	1039	720	0	1150	540	971	807
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.9	15.7	15.8	14.9	18.3	18.4	18.3	0.0	17.0	19.9	19.1	19.0
Incr Delay (d2), s/veh	0.3	0.4	0.4	0.0	0.7	0.8	0.5	0.0	0.2	0.4	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	2.1	2.0	0.2	1.9	1.9	1.5	0.0	0.8	0.8	0.7	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.1	16.1	16.2	14.9	19.0	19.2	18.8	0.0	17.1	20.3	19.4	19.2
LnGrp LOS	B	B	B	B	B	B	B	A	B	C	B	B
Approach Vol, veh/h		678			437			261			220	
Approach Delay, s/veh		15.3			18.8			18.1			19.7	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.1	18.2	12.9	12.2	9.6	14.7	10.2	14.9
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	2.7	8.2	6.1	3.9	5.9	7.4	4.2	4.3
Green Ext Time (p_c), s	0.0	0.5	0.2	0.1	0.2	0.4	0.1	0.1

Intersection Summary		
HCM 6th Ctrl Delay	17.3	
HCM 6th LOS	B	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	15.7
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	119	45	384	41	27	279
Future Vol, veh/h	119	45	384	41	27	279
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	140	53	452	48	32	328
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	11.9	18.5	13.9
HCM LOS	B	C	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	73%	9%
Vol Thru, %	90%	0%	91%
Vol Right, %	10%	27%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	425	164	306
LT Vol	0	119	27
Through Vol	384	0	279
RT Vol	41	45	0
Lane Flow Rate	500	193	360
Geometry Grp	1	1	1
Degree of Util (X)	0.693	0.322	0.523
Departure Headway (Hd)	4.989	6	5.227
Convergence, Y/N	Yes	Yes	Yes
Cap	725	598	691
Service Time	3.018	4.042	3.26
HCM Lane V/C Ratio	0.69	0.323	0.521
HCM Control Delay	18.5	11.9	13.9
HCM Lane LOS	C	B	B
HCM 95th-tile Q	5.6	1.4	3.1

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	16	0	0	31	0	0	0	0	0	0	13
Future Vol, veh/h	3	16	0	0	31	0	0	0	0	0	0	13
Conflicting Peds, #/hr	0	0	1	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	19	0	0	36	0	0	0	0	0	0	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	37	0	0	20	0	0	72	65	20	64	65	37
Stage 1	-	-	-	-	-	-	28	28	-	37	37	-
Stage 2	-	-	-	-	-	-	44	37	-	27	28	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1574	-	-	1596	-	-	919	826	1058	930	826	1035
Stage 1	-	-	-	-	-	-	989	872	-	978	864	-
Stage 2	-	-	-	-	-	-	970	864	-	990	872	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1573	-	-	1594	-	-	902	822	1057	927	822	1034
Mov Cap-2 Maneuver	-	-	-	-	-	-	902	822	-	927	822	-
Stage 1	-	-	-	-	-	-	985	869	-	974	863	-
Stage 2	-	-	-	-	-	-	956	863	-	987	869	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.2	0	0	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1573	-	-	1594	-	-	1034
HCM Lane V/C Ratio	-	0.002	-	-	-	-	-	0.015
HCM Control Delay (s)	0	7.3	0	-	0	-	-	8.5
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

HCM 6th TWSC
3: Hembree Lane & Jensen Lane 10/19/2021

Intersection	
Int Delay, s/veh	5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	108	37	430	41	12	488
Future Vol, veh/h	108	37	430	41	12	488
Conflicting Peds, #/hr	0	0	0	6	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	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	123	42	489	47	14	555

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1102	519	0	0	542	0
Stage 1	519	-	-	-	-	-
Stage 2	583	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	234	557	-	-	1027	-
Stage 1	597	-	-	-	-	-
Stage 2	558	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	228	554	-	-	1021	-
Mov Cap-2 Maneuver	228	-	-	-	-	-
Stage 1	593	-	-	-	-	-
Stage 2	547	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	37.7	0	0.2
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	268	1021	-
HCM Lane V/C Ratio	-	-	0.615	0.013	-
HCM Control Delay (s)	-	-	37.7	8.6	0
HCM Lane LOS	-	-	E	A	A
HCM 95th %tile Q(veh)	-	-	3.7	0	-

HCM 6th Signalized Intersection Summary
4: Hembree Lane & Old Redwood Highway 10/19/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	131	475	110	51	478	233	116	90	33	273	141	219
Future Volume (veh/h)	131	475	110	51	478	233	116	90	33	273	141	219
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	149	540	80	58	543	249	132	102	19	310	160	151
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	319	959	142	356	659	301	258	193	36	359	344	286
Arrive On Green	0.09	0.31	0.31	0.06	0.28	0.28	0.14	0.13	0.13	0.20	0.18	0.18
Sat Flow, veh/h	1781	3090	456	1781	2337	1068	1781	1524	284	1781	1870	1556
Grp Volume(v), veh/h	149	310	310	58	412	380	132	0	121	310	160	151
Grp Sat Flow(s),veh/h/ln	1781	1777	1769	1781	1777	1629	1781	0	1808	1781	1870	1556
Q Serve(g_s), s	3.6	9.0	9.1	1.4	13.4	13.5	4.2	0.0	3.9	10.4	4.7	5.4
Cycle Q Clear(g_c), s	3.6	9.0	9.1	1.4	13.4	13.5	4.2	0.0	3.9	10.4	4.7	5.4
Prop In Lane	1.00		0.26	1.00		0.66	1.00		0.16	1.00		1.00
Lane Grp Cap(c), veh/h	319	551	549	356	501	459	258	0	229	359	344	286
V/C Ratio(X)	0.47	0.56	0.57	0.16	0.82	0.83	0.51	0.00	0.53	0.86	0.47	0.53
Avail Cap(c_a), veh/h	591	977	973	592	880	807	575	0	907	431	775	645
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.2	17.9	17.9	14.3	20.8	20.8	24.5	0.0	25.3	23.9	22.6	22.9
Incr Delay (d2), s/veh	0.4	0.3	0.3	0.1	1.3	1.5	0.6	0.0	0.7	12.6	0.4	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	3.3	3.4	0.5	5.1	4.8	1.7	0.0	1.6	5.2	1.9	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.6	18.2	18.2	14.4	22.1	22.3	25.1	0.0	26.0	36.6	22.9	23.4
LnGrp LOS	B	B	B	B	C	C	C	A	C	D	C	C
Approach Vol, veh/h		769			850			253			621	
Approach Delay, s/veh		17.7			21.7			25.5			29.9	
Approach LOS		B			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.8	24.5	13.0	16.7	9.5	22.8	16.5	13.2
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	3.4	11.1	6.2	7.4	5.6	15.5	12.4	5.9
Green Ext Time (p_c), s	0.0	0.6	0.1	0.4	0.1	0.9	0.1	0.1

Intersection Summary		
HCM 6th Ctrl Delay	22.9	
HCM 6th LOS	C	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	87	23	197	109	42	190
Future Vol, veh/h	87	23	197	109	42	190
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	102	27	232	128	49	224
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9.7	10.8	10.4
HCM LOS	A	B	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	79%	18%
Vol Thru, %	64%	0%	82%
Vol Right, %	36%	21%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	306	110	232
LT Vol	0	87	42
Through Vol	197	0	190
RT Vol	109	23	0
Lane Flow Rate	360	129	273
Geometry Grp	1	1	1
Degree of Util (X)	0.438	0.192	0.357
Departure Headway (Hd)	4.383	5.347	4.704
Convergence, Y/N	Yes	Yes	Yes
Cap	821	666	762
Service Time	2.424	3.413	2.75
HCM Lane V/C Ratio	0.438	0.194	0.358
HCM Control Delay	10.8	9.7	10.4
HCM Lane LOS	B	A	B
HCM 95th-tile Q	2.2	0.7	1.6

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	30	0	0	19	0	0	0	0	0	0	8
Future Vol, veh/h	10	30	0	0	19	0	0	0	0	0	0	8
Conflicting Peds, #/hr	0	0	1	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	35	0	0	22	0	0	0	0	0	0	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	23	0	0	36	0	0	87	83	36	82	83	23
Stage 1	-	-	-	-	-	-	60	60	-	23	23	-
Stage 2	-	-	-	-	-	-	27	23	-	59	60	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1592	-	-	1575	-	-	899	807	1037	905	807	1054
Stage 1	-	-	-	-	-	-	951	845	-	995	876	-
Stage 2	-	-	-	-	-	-	990	876	-	953	845	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1590	-	-	1574	-	-	885	799	1036	899	799	1053
Mov Cap-2 Maneuver	-	-	-	-	-	-	885	799	-	899	799	-
Stage 1	-	-	-	-	-	-	942	837	-	986	875	-
Stage 2	-	-	-	-	-	-	981	875	-	945	837	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	0	0	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1590	-	-	1574	-	-	1053
HCM Lane V/C Ratio	-	0.007	-	-	-	-	-	0.009
HCM Control Delay (s)	0	7.3	0	-	0	-	-	8.5
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	72	22	360	113	40	279
Future Vol, veh/h	72	22	360	113	40	279
Conflicting Peds, #/hr	0	0	0	6	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	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	25	409	128	45	317

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	886	479	0	0	543	0
Stage 1	479	-	-	-	-	-
Stage 2	407	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	315	587	-	-	1026	-
Stage 1	623	-	-	-	-	-
Stage 2	672	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	296	584	-	-	1020	-
Mov Cap-2 Maneuver	296	-	-	-	-	-
Stage 1	619	-	-	-	-	-
Stage 2	636	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.7	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	335	1020	-
HCM Lane V/C Ratio	-	-	0.319	0.045	-
HCM Control Delay (s)	-	-	20.7	8.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.3	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	273	564	197	37	392	182	179	110	33	153	103	199
Future Volume (veh/h)	273	564	197	37	392	182	179	110	33	153	103	199
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	287	594	165	39	413	177	188	116	17	161	108	118
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	451	910	252	317	558	236	297	229	34	260	230	191
Arrive On Green	0.15	0.33	0.33	0.05	0.23	0.23	0.17	0.14	0.14	0.15	0.12	0.12
Sat Flow, veh/h	1781	2726	755	1781	2399	1014	1781	1587	233	1781	1870	1552
Grp Volume(v), veh/h	287	387	372	39	304	286	188	0	133	161	108	118
Grp Sat Flow(s),veh/h/ln	1781	1777	1704	1781	1777	1636	1781	0	1820	1781	1870	1552
Q Serve(g_s), s	6.4	10.5	10.6	0.9	9.0	9.2	5.6	0.0	3.8	4.8	3.1	4.1
Cycle Q Clear(g_c), s	6.4	10.5	10.6	0.9	9.0	9.2	5.6	0.0	3.8	4.8	3.1	4.1
Prop In Lane	1.00		0.44	1.00		0.62	1.00		0.13	1.00		1.00
Lane Grp Cap(c), veh/h	451	593	569	317	413	380	297	0	263	260	230	191
V/C Ratio(X)	0.64	0.65	0.65	0.12	0.74	0.75	0.63	0.00	0.51	0.62	0.47	0.62
Avail Cap(c_a), veh/h	655	1067	1023	607	960	884	627	0	997	470	846	702
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.1	16.1	16.1	15.2	20.2	20.3	22.0	0.0	22.4	22.8	23.2	23.6
Incr Delay (d2), s/veh	0.6	0.5	0.5	0.1	1.0	1.1	0.8	0.0	0.6	0.9	0.6	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	3.7	3.6	0.3	3.4	3.2	2.2	0.0	1.5	1.9	1.2	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.7	16.6	16.6	15.3	21.2	21.4	22.9	0.0	23.0	23.7	23.7	24.8
LnGrp LOS	B	B	B	B	C	C	C	A	C	C	C	C
Approach Vol, veh/h		1046			629			321			387	
Approach Delay, s/veh		15.8			20.9			22.9			24.0	
Approach LOS		B			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.8	24.3	13.5	12.3	12.5	18.5	12.3	13.5
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	2.9	12.6	7.6	6.1	8.4	11.2	6.8	5.8
Green Ext Time (p_c), s	0.0	0.8	0.2	0.3	0.2	0.7	0.1	0.1

Intersection Summary	
HCM 6th Ctrl Delay	19.4
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	15.6
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	115	48	384	39	28	279
Future Vol, veh/h	115	48	384	39	28	279
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	135	56	452	46	33	328
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	11.8	18.4	13.9
HCM LOS	B	C	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	71%	9%
Vol Thru, %	91%	0%	91%
Vol Right, %	9%	29%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	423	163	307
LT Vol	0	115	28
Through Vol	384	0	279
RT Vol	39	48	0
Lane Flow Rate	498	192	361
Geometry Grp	1	1	1
Degree of Util (X)	0.689	0.319	0.524
Departure Headway (Hd)	4.986	5.98	5.218
Convergence, Y/N	Yes	Yes	Yes
Cap	727	600	690
Service Time	3.015	4.021	3.249
HCM Lane V/C Ratio	0.685	0.32	0.523
HCM Control Delay	18.4	11.8	13.9
HCM Lane LOS	C	B	B
HCM 95th-tile Q	5.5	1.4	3.1

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	15	0	0	30	0	0	0	0	0	0	13
Future Vol, veh/h	3	15	0	0	30	0	0	0	0	0	0	13
Conflicting Peds, #/hr	0	0	1	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	18	0	0	35	0	0	0	0	0	0	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	36	0	0	19	0	0	70	63	19	62	63	36
Stage 1	-	-	-	-	-	-	27	27	-	36	36	-
Stage 2	-	-	-	-	-	-	43	36	-	26	27	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1575	-	-	1597	-	-	922	828	1059	933	828	1037
Stage 1	-	-	-	-	-	-	990	873	-	980	865	-
Stage 2	-	-	-	-	-	-	971	865	-	992	873	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1574	-	-	1595	-	-	905	824	1058	930	824	1036
Mov Cap-2 Maneuver	-	-	-	-	-	-	905	824	-	930	824	-
Stage 1	-	-	-	-	-	-	986	870	-	976	864	-
Stage 2	-	-	-	-	-	-	957	864	-	989	870	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.2	0	0	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1574	-	-	1595	-	-	1036
HCM Lane V/C Ratio	-	0.002	-	-	-	-	-	0.015
HCM Control Delay (s)	0	7.3	0	-	0	-	-	8.5
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	93	34	430	36	11	488
Future Vol, veh/h	93	34	430	36	11	488
Conflicting Peds, #/hr	0	0	0	6	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	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	106	39	489	41	13	555

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1097	516	0	0	536	0
Stage 1	516	-	-	-	-	-
Stage 2	581	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	236	559	-	-	1032	-
Stage 1	599	-	-	-	-	-
Stage 2	559	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	230	556	-	-	1026	-
Mov Cap-2 Maneuver	230	-	-	-	-	-
Stage 1	595	-	-	-	-	-
Stage 2	549	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	32.1	0	0.2
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 273	1026	-
HCM Lane V/C Ratio	-	- 0.529	0.012	-
HCM Control Delay (s)	-	- 32.1	8.6	0
HCM Lane LOS	-	- D	A	A
HCM 95th %tile Q(veh)	-	- 2.9	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	131	475	110	51	478	226	116	90	33	254	141	219
Future Volume (veh/h)	131	475	110	51	478	226	116	90	33	254	141	219
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	149	540	80	58	543	241	132	102	19	289	160	151
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	326	959	141	360	664	294	262	198	37	340	324	269
Arrive On Green	0.09	0.31	0.31	0.06	0.28	0.28	0.15	0.13	0.13	0.19	0.17	0.17
Sat Flow, veh/h	1781	3090	456	1781	2365	1046	1781	1524	284	1781	1870	1556
Grp Volume(v), veh/h	149	310	310	58	408	376	132	0	121	289	160	151
Grp Sat Flow(s),veh/h/ln	1781	1777	1769	1781	1777	1634	1781	0	1808	1781	1870	1556
Q Serve(g_s), s	3.5	8.8	8.9	1.3	12.9	13.0	4.1	0.0	3.8	9.5	4.7	5.4
Cycle Q Clear(g_c), s	3.5	8.8	8.9	1.3	12.9	13.0	4.1	0.0	3.8	9.5	4.7	5.4
Prop In Lane	1.00		0.26	1.00		0.64	1.00		0.16	1.00		1.00
Lane Grp Cap(c), veh/h	326	551	549	360	499	459	262	0	234	340	324	269
V/C Ratio(X)	0.46	0.56	0.57	0.16	0.82	0.82	0.50	0.00	0.52	0.85	0.49	0.56
Avail Cap(c_a), veh/h	606	1002	998	603	902	829	589	0	930	442	795	661
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.8	17.4	17.4	14.0	20.3	20.3	23.7	0.0	24.6	23.6	22.6	22.9
Incr Delay (d2), s/veh	0.4	0.3	0.3	0.1	1.3	1.4	0.6	0.0	0.7	9.6	0.4	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	3.2	3.3	0.5	4.9	4.6	1.6	0.0	1.5	4.4	1.9	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.2	17.8	17.8	14.0	21.6	21.7	24.3	0.0	25.2	33.2	23.0	23.6
LnGrp LOS	B	B	B	B	C	C	C	A	C	C	C	C
Approach Vol, veh/h		769			842			253			600	
Approach Delay, s/veh		17.3			21.1			24.7			28.1	
Approach LOS		B			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.7	24.1	12.9	15.8	9.5	22.3	15.5	13.1
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	3.3	10.9	6.1	7.4	5.5	15.0	11.5	5.8
Green Ext Time (p_c), s	0.0	0.6	0.1	0.4	0.1	0.9	0.2	0.1

Intersection Summary	
HCM 6th Ctrl Delay	22.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	86	25	197	104	46	186
Future Vol, veh/h	86	25	197	104	46	186
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	101	29	232	122	54	219
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9.7	10.8	10.4
HCM LOS	A	B	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	77%	20%
Vol Thru, %	65%	0%	80%
Vol Right, %	35%	23%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	301	111	232
LT Vol	0	86	46
Through Vol	197	0	186
RT Vol	104	25	0
Lane Flow Rate	354	131	273
Geometry Grp	1	1	1
Degree of Util (X)	0.432	0.193	0.357
Departure Headway (Hd)	4.392	5.324	4.704
Convergence, Y/N	Yes	Yes	Yes
Cap	818	670	762
Service Time	2.433	3.39	2.75
HCM Lane V/C Ratio	0.433	0.196	0.358
HCM Control Delay	10.8	9.7	10.4
HCM Lane LOS	B	A	B
HCM 95th-tile Q	2.2	0.7	1.6

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	28	0	0	18	0	0	0	0	0	0	8
Future Vol, veh/h	10	28	0	0	18	0	0	0	0	0	0	8
Conflicting Peds, #/hr	0	0	1	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	33	0	0	21	0	0	0	0	0	0	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	22	0	0	34	0	0	84	80	34	79	80	22
Stage 1	-	-	-	-	-	-	58	58	-	22	22	-
Stage 2	-	-	-	-	-	-	26	22	-	57	58	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1593	-	-	1578	-	-	903	810	1039	910	810	1055
Stage 1	-	-	-	-	-	-	954	847	-	996	877	-
Stage 2	-	-	-	-	-	-	992	877	-	955	847	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1591	-	-	1576	-	-	889	802	1038	904	802	1054
Mov Cap-2 Maneuver	-	-	-	-	-	-	889	802	-	904	802	-
Stage 1	-	-	-	-	-	-	945	839	-	987	876	-
Stage 2	-	-	-	-	-	-	983	876	-	947	839	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	0	0	8.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1591	-	-	1576	-	-	1054
HCM Lane V/C Ratio	-	0.007	-	-	-	-	-	0.009
HCM Control Delay (s)	0	7.3	0	-	0	-	-	8.4
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	62	20	360	96	36	279
Future Vol, veh/h	62	20	360	96	36	279
Conflicting Peds, #/hr	0	0	0	6	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	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	70	23	409	109	41	317

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	869	470	0	0	524	0
Stage 1	470	-	-	-	-	-
Stage 2	399	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	322	594	-	-	1043	-
Stage 1	629	-	-	-	-	-
Stage 2	678	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	305	591	-	-	1037	-
Mov Cap-2 Maneuver	305	-	-	-	-	-
Stage 1	625	-	-	-	-	-
Stage 2	645	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.2	0	1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	346	1037	-
HCM Lane V/C Ratio	-	-	0.269	0.039	-
HCM Control Delay (s)	-	-	19.2	8.6	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	273	564	197	37	392	160	179	110	33	140	103	199
Future Volume (veh/h)	273	564	197	37	392	160	179	110	33	140	103	199
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	287	594	165	39	413	153	188	116	17	147	108	118
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	457	894	248	313	567	207	300	236	35	256	233	193
Arrive On Green	0.15	0.33	0.33	0.05	0.23	0.23	0.17	0.15	0.15	0.14	0.12	0.12
Sat Flow, veh/h	1781	2726	755	1781	2515	919	1781	1588	233	1781	1870	1552
Grp Volume(v), veh/h	287	387	372	39	290	276	188	0	133	147	108	118
Grp Sat Flow(s),veh/h/ln	1781	1777	1704	1781	1777	1657	1781	0	1820	1781	1870	1552
Q Serve(g_s), s	6.4	10.5	10.6	0.9	8.5	8.7	5.5	0.0	3.8	4.3	3.0	4.1
Cycle Q Clear(g_c), s	6.4	10.5	10.6	0.9	8.5	8.7	5.5	0.0	3.8	4.3	3.0	4.1
Prop In Lane	1.00		0.44	1.00		0.55	1.00		0.13	1.00		1.00
Lane Grp Cap(c), veh/h	457	583	559	313	401	374	300	0	271	256	233	193
V/C Ratio(X)	0.63	0.66	0.67	0.12	0.72	0.74	0.63	0.00	0.49	0.57	0.46	0.61
Avail Cap(c_a), veh/h	663	1077	1033	607	970	904	633	0	1006	475	855	709
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.1	16.2	16.3	15.4	20.2	20.2	21.7	0.0	22.0	22.5	22.9	23.3
Incr Delay (d2), s/veh	0.5	0.5	0.5	0.1	0.9	1.1	0.8	0.0	0.5	0.8	0.5	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	3.7	3.6	0.3	3.2	3.1	2.1	0.0	1.5	1.7	1.2	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.6	16.7	16.8	15.4	21.1	21.3	22.6	0.0	22.5	23.2	23.4	24.5
LnGrp LOS	B	B	B	B	C	C	C	A	C	C	C	C
Approach Vol, veh/h		1046			605			321			373	
Approach Delay, s/veh		15.9			20.8			22.5			23.7	
Approach LOS		B			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.7	23.7	13.5	12.3	12.5	18.0	12.1	13.7
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	2.9	12.6	7.5	6.1	8.4	10.7	6.3	5.8
Green Ext Time (p_c), s	0.0	0.8	0.2	0.3	0.2	0.6	0.1	0.1

Intersection Summary	
HCM 6th Ctrl Delay	19.3
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	16.4
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	131	49	384	46	28	279
Future Vol, veh/h	131	49	384	46	28	279
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	154	58	452	54	33	328
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	12.4	19.6	14.3
HCM LOS	B	C	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	73%	9%
Vol Thru, %	89%	0%	91%
Vol Right, %	11%	27%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	430	180	307
LT Vol	0	131	28
Through Vol	384	0	279
RT Vol	46	49	0
Lane Flow Rate	506	212	361
Geometry Grp	1	1	1
Degree of Util (X)	0.711	0.355	0.533
Departure Headway (Hd)	5.062	6.042	5.317
Convergence, Y/N	Yes	Yes	Yes
Cap	713	595	679
Service Time	3.094	4.087	3.353
HCM Lane V/C Ratio	0.71	0.356	0.532
HCM Control Delay	19.6	12.4	14.3
HCM Lane LOS	C	B	B
HCM 95th-tile Q	6	1.6	3.2

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	16	6	0	31	0	16	0	0	0	0	13
Future Vol, veh/h	3	16	6	0	31	0	16	0	0	0	0	13
Conflicting Peds, #/hr	0	0	1	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	19	7	0	36	0	19	0	0	0	0	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	37	0	0	27	0	0	76	69	24	68	72	37
Stage 1	-	-	-	-	-	-	32	32	-	37	37	-
Stage 2	-	-	-	-	-	-	44	37	-	31	35	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1574	-	-	1587	-	-	914	822	1052	925	818	1035
Stage 1	-	-	-	-	-	-	984	868	-	978	864	-
Stage 2	-	-	-	-	-	-	970	864	-	986	866	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1573	-	-	1585	-	-	898	818	1051	922	814	1034
Mov Cap-2 Maneuver	-	-	-	-	-	-	898	818	-	922	814	-
Stage 1	-	-	-	-	-	-	980	865	-	974	863	-
Stage 2	-	-	-	-	-	-	956	863	-	983	863	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0	9.1	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	898	1573	-	-	1585	-	-	1034
HCM Lane V/C Ratio	0.021	0.002	-	-	-	-	-	0.015
HCM Control Delay (s)	9.1	7.3	0	-	0	-	-	8.5
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

HCM 6th Roundabout
2: Vinecrest Circle & Vinecrest Road 10/29/2021

Intersection	
Intersection Delay, s/veh	2.9
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	29	36	19	15
Demand Flow Rate, veh/h	29	37	19	15
Vehicles Circulating, veh/h	0	23	23	56
Vehicles Exiting, veh/h	71	19	6	4
Ped Vol Crossing Leg, #/h	0	0	1	1
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	2.8	2.9	2.8	2.9
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	29	37	19	15
Cap Entry Lane, veh/h	1380	1348	1348	1303
Entry HV Adj Factor	0.987	0.980	1.000	1.000
Flow Entry, veh/h	29	36	19	15
Cap Entry, veh/h	1362	1321	1348	1303
V/C Ratio	0.021	0.027	0.014	0.012
Control Delay, s/veh	2.8	2.9	2.8	2.9
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	0

HCM 6th TWSC
3: Hembree Lane & Jensen Lane 04/13/2022

Intersection	
Int Delay, s/veh	5.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	108	37	435	41	12	500
Future Vol, veh/h	108	37	435	41	12	500
Conflicting Peds, #/hr	0	0	0	6	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	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	123	42	494	47	14	568

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1120	524	0	0	547	0
Stage 1	524	-	-	-	-	-
Stage 2	596	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	228	553	-	-	1022	-
Stage 1	594	-	-	-	-	-
Stage 2	550	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	222	550	-	-	1016	-
Mov Cap-2 Maneuver	222	-	-	-	-	-
Stage 1	590	-	-	-	-	-
Stage 2	539	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	39.5	0	0.2
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	262	1016	-
HCM Lane V/C Ratio	-	-	0.629	0.013	-
HCM Control Delay (s)	-	-	39.5	8.6	0
HCM Lane LOS	-	-	E	A	A
HCM 95th %tile Q(veh)	-	-	3.9	0	-

HCM 6th Signalized Intersection Summary
4: Hembree Lane & Old Redwood Highway

04/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	133	475	110	51	478	235	116	91	33	277	144	224
Future Volume (veh/h)	133	475	110	51	478	235	116	91	33	277	144	224
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	151	540	80	58	543	251	132	103	19	315	164	157
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	318	960	142	355	658	303	257	192	36	364	348	290
Arrive On Green	0.09	0.31	0.31	0.06	0.28	0.28	0.14	0.13	0.13	0.20	0.19	0.19
Sat Flow, veh/h	1781	3090	456	1781	2331	1074	1781	1527	282	1781	1870	1557
Grp Volume(v), veh/h	151	310	310	58	414	380	132	0	122	315	164	157
Grp Sat Flow(s),veh/h/ln	1781	1777	1769	1781	1777	1627	1781	0	1809	1781	1870	1557
Q Serve(g_s), s	3.6	9.1	9.2	1.4	13.6	13.7	4.3	0.0	3.9	10.7	4.9	5.7
Cycle Q Clear(g_c), s	3.6	9.1	9.2	1.4	13.6	13.7	4.3	0.0	3.9	10.7	4.9	5.7
Prop In Lane	1.00		0.26	1.00		0.66	1.00		0.16	1.00		1.00
Lane Grp Cap(c), veh/h	318	552	550	355	502	460	257	0	228	364	348	290
V/C Ratio(X)	0.48	0.56	0.56	0.16	0.82	0.83	0.51	0.00	0.54	0.87	0.47	0.54
Avail Cap(c_a), veh/h	587	971	967	589	874	801	571	0	902	428	771	641
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.4	18.0	18.0	14.4	20.9	21.0	24.7	0.0	25.5	24.0	22.6	23.0
Incr Delay (d2), s/veh	0.4	0.3	0.3	0.1	1.3	1.5	0.6	0.0	0.7	13.4	0.4	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	3.4	3.4	0.5	5.2	4.8	1.7	0.0	1.6	5.4	2.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.8	18.3	18.3	14.5	22.3	22.4	25.3	0.0	26.3	37.4	23.0	23.6
LnGrp LOS	B	B	B	B	C	C	C	A	C	D	C	C
Approach Vol, veh/h		771			852			254			636	
Approach Delay, s/veh		17.8			21.8			25.8			30.3	
Approach LOS		B			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.8	24.7	13.0	16.9	9.6	22.9	16.7	13.2
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	3.4	11.2	6.3	7.7	5.6	15.7	12.7	5.9
Green Ext Time (p_c), s	0.0	0.6	0.1	0.4	0.1	0.9	0.1	0.1

Intersection Summary	
HCM 6th Ctrl Delay	23.1
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th AWSC
1: Hembree Lane & Vinecrest Road

10/19/2021

Intersection	
Intersection Delay, s/veh	10.8
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	95	26	197	123	46	190
Future Vol, veh/h	95	26	197	123	46	190
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	112	31	232	145	54	224
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9.9	11.2	10.6
HCM LOS	A	B	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	79%	19%
Vol Thru, %	62%	0%	81%
Vol Right, %	38%	21%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	320	121	236
LT Vol	0	95	46
Through Vol	197	0	190
RT Vol	123	26	0
Lane Flow Rate	376	142	278
Geometry Grp	1	1	1
Degree of Util (X)	0.462	0.213	0.368
Departure Headway (Hd)	4.415	5.392	4.766
Convergence, Y/N	Yes	Yes	Yes
Cap	813	661	752
Service Time	2.462	3.468	2.82
HCM Lane V/C Ratio	0.462	0.215	0.37
HCM Control Delay	11.2	9.9	10.6
HCM Lane LOS	B	A	B
HCM 95th-tile Q	2.5	0.8	1.7

HCM 6th TWSC
2: Vinecrest Circle & Vinecrest Road 10/19/2021

Intersection												
Int Delay, s/veh	2.5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	10	30	18	0	19	0	11	0	0	0	0	8
Future Vol, veh/h	10	30	18	0	19	0	11	0	0	0	0	8
Conflicting Peds, #/hr	0	0	1	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	35	21	0	22	0	13	0	0	0	0	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	23	0	0	57	0	0	98	94	47	93	104	23
Stage 1	-	-	-	-	-	-	71	71	-	23	23	-
Stage 2	-	-	-	-	-	-	27	23	-	70	81	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1592	-	-	1547	-	-	884	796	1022	891	786	1054
Stage 1	-	-	-	-	-	-	939	836	-	995	876	-
Stage 2	-	-	-	-	-	-	990	876	-	940	828	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1590	-	-	1546	-	-	870	788	1021	885	778	1053
Mov Cap-2 Maneuver	-	-	-	-	-	-	870	788	-	885	778	-
Stage 1	-	-	-	-	-	-	931	828	-	986	875	-
Stage 2	-	-	-	-	-	-	981	875	-	932	821	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	0	9.2	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	870	1590	-	-	1546	-	-	1053
HCM Lane V/C Ratio	0.015	0.007	-	-	-	-	-	0.009
HCM Control Delay (s)	9.2	7.3	0	-	0	-	-	8.5
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

HCM 6th Roundabout
2: Vinecrest Circle & Vinecrest Road 10/29/2021

Intersection	
Intersection Delay, s/veh	2.9
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	68	22	13	9
Demand Flow Rate, veh/h	69	22	13	9
Vehicles Circulating, veh/h	0	25	48	35
Vehicles Exiting, veh/h	44	36	21	12
Ped Vol Crossing Leg, #/h	0	0	1	1
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.0	2.9	2.8	2.8
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	69	22	13	9
Cap Entry Lane, veh/h	1380	1345	1314	1331
Entry HV Adj Factor	0.990	0.980	1.000	1.000
Flow Entry, veh/h	68	22	13	9
Cap Entry, veh/h	1366	1319	1314	1331
V/C Ratio	0.050	0.016	0.010	0.007
Control Delay, s/veh	3.0	2.9	2.8	2.8
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	0

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	72	22	374	113	40	287
Future Vol, veh/h	72	22	374	113	40	287
Conflicting Peds, #/hr	0	0	0	6	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	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	25	425	128	45	326

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	911	495	0	0	559	0
Stage 1	495	-	-	-	-	-
Stage 2	416	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	304	575	-	-	1012	-
Stage 1	613	-	-	-	-	-
Stage 2	666	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	285	572	-	-	1006	-
Mov Cap-2 Maneuver	285	-	-	-	-	-
Stage 1	609	-	-	-	-	-
Stage 2	629	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.6	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 323	1006	-
HCM Lane V/C Ratio	-	- 0.331	0.045	-
HCM Control Delay (s)	-	- 21.6	8.7	0
HCM Lane LOS	-	- C	A	A
HCM 95th %tile Q(veh)	-	- 1.4	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	278	564	197	37	392	187	179	113	33	156	105	202
Future Volume (veh/h)	278	564	197	37	392	187	179	113	33	156	105	202
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	293	594	165	39	413	182	188	119	17	164	111	122
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	454	919	255	319	556	241	296	228	33	260	229	190
Arrive On Green	0.15	0.34	0.34	0.05	0.23	0.23	0.17	0.14	0.14	0.15	0.12	0.12
Sat Flow, veh/h	1781	2726	755	1781	2377	1032	1781	1593	228	1781	1870	1552
Grp Volume(v), veh/h	293	387	372	39	307	288	188	0	136	164	111	122
Grp Sat Flow(s),veh/h/ln	1781	1777	1704	1781	1777	1632	1781	0	1821	1781	1870	1552
Q Serve(g_s), s	6.5	10.5	10.6	0.9	9.2	9.4	5.6	0.0	4.0	4.9	3.2	4.3
Cycle Q Clear(g_c), s	6.5	10.5	10.6	0.9	9.2	9.4	5.6	0.0	4.0	4.9	3.2	4.3
Prop In Lane	1.00		0.44	1.00		0.63	1.00		0.13	1.00		1.00
Lane Grp Cap(c), veh/h	454	599	575	319	415	382	296	0	260	260	229	190
V/C Ratio(X)	0.65	0.65	0.65	0.12	0.74	0.75	0.64	0.00	0.52	0.63	0.48	0.64
Avail Cap(c_a), veh/h	651	1061	1017	607	955	877	624	0	991	468	841	698
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.1	16.0	16.1	15.2	20.3	20.4	22.2	0.0	22.7	23.0	23.4	23.9
Incr Delay (d2), s/veh	0.6	0.4	0.5	0.1	1.0	1.1	0.8	0.0	0.6	0.9	0.6	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	3.7	3.6	0.3	3.5	3.3	2.2	0.0	1.6	1.9	1.3	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.7	16.5	16.5	15.3	21.3	21.5	23.0	0.0	23.3	23.9	24.0	25.2
LnGrp LOS	B	B	B	B	C	C	C	A	C	C	C	C
Approach Vol, veh/h		1052			634			324			397	
Approach Delay, s/veh		15.7			21.0			23.2			24.3	
Approach LOS		B			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.8	24.6	13.5	12.3	12.7	18.7	12.3	13.5
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	2.9	12.6	7.6	6.3	8.5	11.4	6.9	6.0
Green Ext Time (p_c), s	0.0	0.8	0.2	0.3	0.3	0.7	0.1	0.1

Intersection Summary		
HCM 6th Ctrl Delay		19.5
HCM 6th LOS		B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	16.1
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	123	52	384	42	29	279
Future Vol, veh/h	123	52	384	42	29	279
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	145	61	452	49	34	328
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	12.2	19.1	14.2
HCM LOS	B	C	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	70%	9%
Vol Thru, %	90%	0%	91%
Vol Right, %	10%	30%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	426	175	308
LT Vol	0	123	29
Through Vol	384	0	279
RT Vol	42	52	0
Lane Flow Rate	501	206	362
Geometry Grp	1	1	1
Degree of Util (X)	0.702	0.343	0.532
Departure Headway (Hd)	5.041	6.006	5.283
Convergence, Y/N	Yes	Yes	Yes
Cap	717	597	681
Service Time	3.072	4.051	3.317
HCM Lane V/C Ratio	0.699	0.345	0.532
HCM Control Delay	19.1	12.2	14.2
HCM Lane LOS	C	B	B
HCM 95th-tile Q	5.8	1.5	3.2

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	15	4	0	30	0	12	0	0	0	0	13
Future Vol, veh/h	3	15	4	0	30	0	12	0	0	0	0	13
Conflicting Peds, #/hr	0	0	1	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	18	5	0	35	0	14	0	0	0	0	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	36	0	0	24	0	0	73	66	22	65	68	36
Stage 1	-	-	-	-	-	-	30	30	-	36	36	-
Stage 2	-	-	-	-	-	-	43	36	-	29	32	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1575	-	-	1591	-	-	918	825	1055	929	823	1037
Stage 1	-	-	-	-	-	-	987	870	-	980	865	-
Stage 2	-	-	-	-	-	-	971	865	-	988	868	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1574	-	-	1589	-	-	901	821	1054	926	819	1036
Mov Cap-2 Maneuver	-	-	-	-	-	-	901	821	-	926	819	-
Stage 1	-	-	-	-	-	-	983	867	-	976	864	-
Stage 2	-	-	-	-	-	-	957	864	-	985	865	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0	9.1	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	901	1574	-	-	1589	-	-	1036
HCM Lane V/C Ratio	0.016	0.002	-	-	-	-	-	0.015
HCM Control Delay (s)	9.1	7.3	0	-	0	-	-	8.5
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	4.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	96	34	433	37	11	496
Future Vol, veh/h	96	34	433	37	11	496
Conflicting Peds, #/hr	0	0	0	6	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	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	109	39	492	42	13	564

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1109	519	0	0	540	0
Stage 1	519	-	-	-	-	-
Stage 2	590	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	232	557	-	-	1028	-
Stage 1	597	-	-	-	-	-
Stage 2	554	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	226	554	-	-	1022	-
Mov Cap-2 Maneuver	226	-	-	-	-	-
Stage 1	593	-	-	-	-	-
Stage 2	543	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34	0	0.2
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	267	1022	-
HCM Lane V/C Ratio	-	-	0.553	0.012	-
HCM Control Delay (s)	-	-	34	8.6	0
HCM Lane LOS	-	-	D	A	A
HCM 95th %tile Q(veh)	-	-	3.1	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	133	475	110	51	478	227	116	91	33	257	144	224
Future Volume (veh/h)	133	475	110	51	478	227	116	91	33	257	144	224
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	151	540	80	58	543	242	132	103	19	292	164	157
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	326	959	142	360	664	295	262	197	36	343	327	272
Arrive On Green	0.09	0.31	0.31	0.06	0.28	0.28	0.15	0.13	0.13	0.19	0.17	0.17
Sat Flow, veh/h	1781	3090	456	1781	2361	1049	1781	1527	282	1781	1870	1556
Grp Volume(v), veh/h	151	310	310	58	408	377	132	0	122	292	164	157
Grp Sat Flow(s),veh/h/ln	1781	1777	1769	1781	1777	1633	1781	0	1809	1781	1870	1556
Q Serve(g_s), s	3.5	8.8	8.9	1.3	13.0	13.1	4.1	0.0	3.8	9.6	4.8	5.6
Cycle Q Clear(g_c), s	3.5	8.8	8.9	1.3	13.0	13.1	4.1	0.0	3.8	9.6	4.8	5.6
Prop In Lane	1.00		0.26	1.00		0.64	1.00		0.16	1.00		1.00
Lane Grp Cap(c), veh/h	326	552	549	360	499	459	262	0	234	343	327	272
V/C Ratio(X)	0.46	0.56	0.57	0.16	0.82	0.82	0.50	0.00	0.52	0.85	0.50	0.58
Avail Cap(c_a), veh/h	604	998	994	602	898	826	587	0	926	440	792	659
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.9	17.5	17.5	14.0	20.4	20.4	23.9	0.0	24.7	23.7	22.7	23.0
Incr Delay (d2), s/veh	0.4	0.3	0.3	0.1	1.3	1.4	0.6	0.0	0.7	10.0	0.4	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	3.2	3.3	0.5	4.9	4.6	1.7	0.0	1.6	4.5	1.9	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.3	17.8	17.8	14.1	21.6	21.8	24.4	0.0	25.4	33.7	23.1	23.7
LnGrp LOS	B	B	B	B	C	C	C	A	C	C	C	C
Approach Vol, veh/h		771			843			254			613	
Approach Delay, s/veh		17.3			21.2			24.9			28.3	
Approach LOS		B			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.7	24.2	12.9	15.9	9.5	22.4	15.7	13.1
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	3.3	10.9	6.1	7.6	5.5	15.1	11.6	5.8
Green Ext Time (p_c), s	0.0	0.6	0.1	0.4	0.1	0.9	0.2	0.1

Intersection Summary		
HCM 6th Ctrl Delay	22.1	
HCM 6th LOS	C	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	10.6
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	91	28	197	113	50	186
Future Vol, veh/h	91	28	197	113	50	186
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	107	33	232	133	59	219
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9.8	11	10.5
HCM LOS	A	B	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	76%	21%
Vol Thru, %	64%	0%	79%
Vol Right, %	36%	24%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	310	119	236
LT Vol	0	91	50
Through Vol	197	0	186
RT Vol	113	28	0
Lane Flow Rate	365	140	278
Geometry Grp	1	1	1
Degree of Util (X)	0.447	0.208	0.366
Departure Headway (Hd)	4.417	5.352	4.749
Convergence, Y/N	Yes	Yes	Yes
Cap	813	666	755
Service Time	2.461	3.422	2.799
HCM Lane V/C Ratio	0.449	0.21	0.368
HCM Control Delay	11	9.8	10.5
HCM Lane LOS	B	A	B
HCM 95th-tile Q	2.3	0.8	1.7

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	28	13	0	18	0	8	0	0	0	0	8
Future Vol, veh/h	10	28	13	0	18	0	8	0	0	0	0	8
Conflicting Peds, #/hr	0	0	1	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	33	15	0	21	0	9	0	0	0	0	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	22	0	0	49	0	0	92	88	42	87	95	22
Stage 1	-	-	-	-	-	-	66	66	-	22	22	-
Stage 2	-	-	-	-	-	-	26	22	-	65	73	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1593	-	-	1558	-	-	892	802	1029	899	795	1055
Stage 1	-	-	-	-	-	-	945	840	-	996	877	-
Stage 2	-	-	-	-	-	-	992	877	-	946	834	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1591	-	-	1557	-	-	878	794	1028	893	787	1054
Mov Cap-2 Maneuver	-	-	-	-	-	-	878	794	-	893	787	-
Stage 1	-	-	-	-	-	-	936	832	-	987	876	-
Stage 2	-	-	-	-	-	-	983	876	-	938	826	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0	9.1	8.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	878	1591	-	-	1557	-	-	1054
HCM Lane V/C Ratio	0.011	0.007	-	-	-	-	-	0.009
HCM Control Delay (s)	9.1	7.3	0	-	0	-	-	8.4
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	64	20	369	100	36	284
Future Vol, veh/h	64	20	369	100	36	284
Conflicting Peds, #/hr	0	0	0	6	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	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	73	23	419	114	41	323

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	887	482	0	0	539	0
Stage 1	482	-	-	-	-	-
Stage 2	405	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	315	584	-	-	1029	-
Stage 1	621	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	298	581	-	-	1023	-
Mov Cap-2 Maneuver	298	-	-	-	-	-
Stage 1	617	-	-	-	-	-
Stage 2	640	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.9	0	1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 337	1023	-
HCM Lane V/C Ratio	-	- 0.283	0.04	-
HCM Control Delay (s)	-	- 19.9	8.7	0
HCM Lane LOS	-	- C	A	A
HCM 95th %tile Q(veh)	-	- 1.1	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	278	564	197	37	392	164	179	113	33	142	105	202
Future Volume (veh/h)	278	564	197	37	392	164	179	113	33	142	105	202
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	293	594	165	39	413	158	188	119	17	149	111	122
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	459	904	250	316	565	213	298	235	34	256	231	192
Arrive On Green	0.15	0.33	0.33	0.05	0.23	0.23	0.17	0.15	0.15	0.14	0.12	0.12
Sat Flow, veh/h	1781	2726	755	1781	2490	939	1781	1594	228	1781	1870	1552
Grp Volume(v), veh/h	293	387	372	39	293	278	188	0	136	149	111	122
Grp Sat Flow(s),veh/h/ln	1781	1777	1704	1781	1777	1653	1781	0	1821	1781	1870	1552
Q Serve(g_s), s	6.5	10.5	10.6	0.9	8.6	8.8	5.6	0.0	3.9	4.4	3.1	4.2
Cycle Q Clear(g_c), s	6.5	10.5	10.6	0.9	8.6	8.8	5.6	0.0	3.9	4.4	3.1	4.2
Prop In Lane	1.00		0.44	1.00		0.57	1.00		0.13	1.00		1.00
Lane Grp Cap(c), veh/h	459	589	565	316	403	375	298	0	269	256	231	192
V/C Ratio(X)	0.64	0.66	0.66	0.12	0.73	0.74	0.63	0.00	0.51	0.58	0.48	0.64
Avail Cap(c_a), veh/h	658	1071	1027	607	964	897	630	0	1001	472	850	705
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.1	16.2	16.2	15.4	20.3	20.3	21.9	0.0	22.2	22.6	23.1	23.6
Incr Delay (d2), s/veh	0.6	0.5	0.5	0.1	0.9	1.1	0.8	0.0	0.6	0.8	0.6	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	3.7	3.6	0.3	3.3	3.1	2.2	0.0	1.6	1.7	1.3	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.7	16.6	16.7	15.5	21.2	21.4	22.7	0.0	22.8	23.4	23.7	24.9
LnGrp LOS	B	B	B	B	C	C	C	A	C	C	C	C
Approach Vol, veh/h		1052			610			324			382	
Approach Delay, s/veh		15.8			20.9			22.8			24.0	
Approach LOS		B			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.7	24.1	13.5	12.3	12.7	18.1	12.1	13.6
Change Period (Y+Rc), s	4.0	* 5.3	4.0	5.3	4.0	5.3	4.0	* 5.3
Max Green Setting (Gmax), s	12.0	* 34	20.0	25.7	15.0	30.7	15.0	* 31
Max Q Clear Time (g_c+I1), s	2.9	12.6	7.6	6.2	8.5	10.8	6.4	5.9
Green Ext Time (p_c), s	0.0	0.8	0.2	0.3	0.3	0.6	0.1	0.1

Intersection Summary	
HCM 6th Ctrl Delay	19.4
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.