Traffic Impact Study for the North River Apartments

Prepared for the City of Petaluma

Submitted by
W-Trans

April 5, 2017

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

Table of Contents

Executive Summary

The proposed North River Apartments project would result in construction of a 184-unit apartment complex, 2,984 square feet of retail, and 1,693 square feet of office. The project's anticipated trip generation is 1,375 trips per day, including 61 a.m. peak hour and 83 p.m. peak hour trips.

The study area was established by the City and includes nine intersections. Analysis indicates that the nine study intersections are operating acceptably under Existing conditions. With the project, the study intersections are expected to continue operating acceptably, except Petaluma Boulevard North/Oak Street, which is expected to operate deficiently at LOS E during the p.m. peak hour, with deficient LOS E or F operation on the eastbound and westbound Oak Street approaches.

Under the Existing plus Pipeline scenario, which includes trips from near-term projects that were indicated by City staff to be included in the analysis, as well as improved signal timing along the East Washington Street corridor, the study intersections are projected to continue operating acceptably, except Lakeville Street/ East Washington Street, which is expected to operate at a deficient LOS E during the p.m. peak hour. Lakeville Street/East Washington Street was identified in the City's General Plan as operating acceptably under near-term and cumulative conditions. However, safety-related changes to the signal phasing and intersection geometry reduced capacity at the intersection. Under the Existing plus Pipeline plus Project scenario, LOS E operation is projected to continue, which is considered a less-than-significant impact under the standards applied.

Operation at Petaluma Boulevard North/Oak Street is expected to degrade to deficient LOS F during the p.m. peak hour, and the eastbound and westbound Oak Street approaches would operate at unacceptable LOS F under Existing plus Pipeline plus Project (Alternative 1 or 2) and Cumulative and Cumulative plus Project (Alternative 1, 2, or 3) during the p.m. peak hour.

An assessment of the Existing plus Project and Existing plus Pipeline plus Project conditions was conducted with access restricted to the project site from North Water Street via East Washington Street to emergency vehicles only. Operation at the study intersections was determined to be consistent regardless of availability of a connection to East Washington Street via North Water Street, except delay worsens at Petaluma Boulevard North/ Oak Street.

Under Cumulative conditions without the project, it is expected that all of the study intersections will operate acceptably with the exception of Lakeville Street/East Washington Street and Petaluma Boulevard North/Oak Street. The eastbound and westbound Oak Street approaches at Petaluma Boulevard North are expected to operate unacceptably at LOS F during both peak hours, though the intersection would operate acceptably overall at LOS D during the a.m. peak hour and unacceptably at LOS F during the p.m. peak hour.

Under Cumulative conditions with project-added volumes, it is expected that all of the study intersections will operate acceptably at LOS D or better overall with the exception of Lakeville Street/East Washington Street and Petaluma Boulevard North/Oak Street. Under the standards applied, the impact at Lakeville Street/East Washington Street would be considered less-than-significant. Deficient overall LOS F is expected at Petaluma Boulevard North/Oak Street during the p.m. peak hour. The eastbound and westbound Oak Street approaches would operate unacceptably at LOS F.

Signalization of Petaluma Boulevard North/Oak Street is warranted under Existing plus Pipeline plus Project conditions, and the applicant should install a traffic signal at the intersection. A signal would also be warranted under cumulative conditions both with and without the project. The signalization of the intersection could result in secondary impacts by altering traffic patterns in the area, resulting in increased traffic volumes along neighborhood streets parallel to Petaluma Boulevard North. The project would contribute limited traffic volumes to these neighborhood streets, and therefore would result in less-than-significant impacts on traffic operation.

Vehicles will access the project via two driveways on North Water Street, both of which are fully accessible. Sight distance at the project driveways is expected to be adequate.

Facilities for pedestrians and bicycles will be adequate upon the construction of planned facilities per the project site plan and installation of "sharrows" along the project's frontages on North Water Street and Oak Street. Wayfinding and bike route signage should be installed on Oak Street, the path along the north side of the project site, and the path along the west side of the Petaluma River.

Introduction

This report presents an analysis of the potential traffic impacts that would be associated with development of the proposed North River Apartments project to be located at 368 and 402 Petaluma Boulevard in the City of Petaluma. The traffic study was completed in accordance with the criteria established by the City of Petaluma, and is consistent with standard traffic engineering techniques.

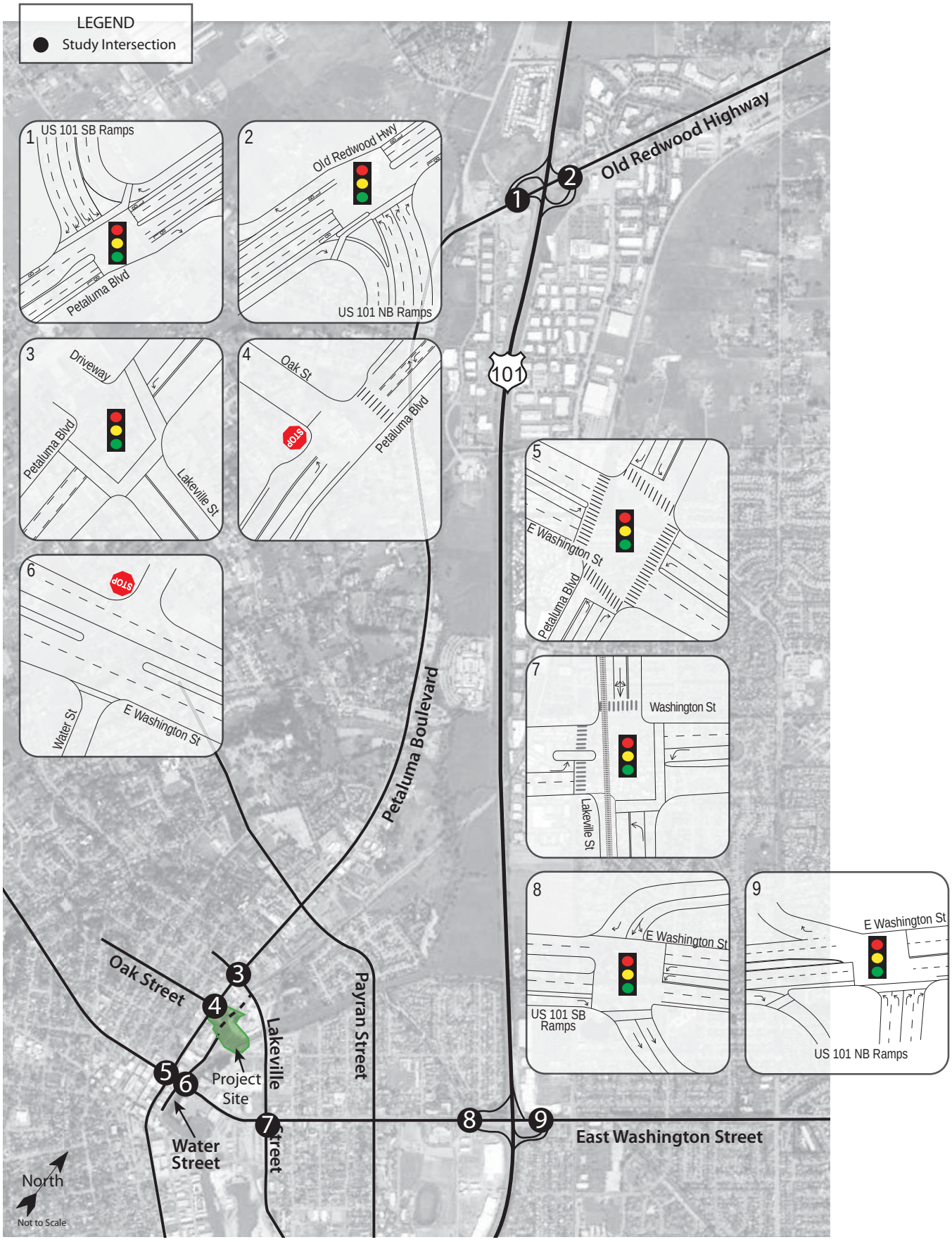
Prelude

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

Project Profile

The project would develop an apartment complex with 184 dwelling units, 2,984 square feet of retail, and 1,693 square feet of office space in Central Petaluma. The project site is currently vacant. The site is bounded by Petaluma Boulevard North to the west of the property, the Petaluma River to the east, and retail or underdeveloped land uses to the north and south.

The project site is located at 368 and 402 Petaluma Boulevard North, as shown in Figure 1.



200pet.ai 1/17

Traffic Impact Study for the North River Apartments

Figure 1 – Study Area and Lane Configurations

Transportation Setting

Operational Analysis

Study Area and Periods

The study area consists of the following intersections:

1. Old Redwood Highway/US 101 Southbound Ramps
2. Old Redwood Highway/US 101 Northbound Ramps
3. Petaluma Boulevard North/Lakeville Street
4. Petaluma Boulevard North/Oak Street
5. Petaluma Boulevard North/East Washington Street
6. East Washington Street/North Water Street
7. East Washington Street/Lakeville Street
8. East Washington Street/US 101 Southbound Ramps
9. East Washington Street/US 101 Northbound

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

Given the orientation of many streets in Petaluma at an angle that is skewed from north-south or east-west, for purposes of the evaluation, the orientation convention used was to consider US 101 and Petaluma Boulevard as north-south streets and East Washington Street and Old Redwood Highway as east-west streets.

Old Redwood Highway/US 101 Southbound Ramps is a signalized tee intersection. For the purpose of this analysis, the US 101 ramps are treated as being north-south and Old Redwood Highway as east-west. Improvements to the interchange were recently completed that add capacity to the on- and off-ramps in both directions.

Old Redwood Highway/US 101 Northbound Ramps is a signalized tee-intersection US 101 ramps was again considered as the north-south approaches, while the Old Redwood Highway approaches are east-west.

Petaluma Boulevard North/Lakeville Street is a four-legged signalized intersection with protected left-turn phasing on the northbound and southbound Petaluma Boulevard North approaches and permitted phasing on the eastbound and westbound approaches. The eastbound approach is a driveway.

Petaluma Boulevard North/Oak Street is currently a tee-intersection with the terminating eastbound Oak Street approach stop-controlled. A crosswalk is provided across the northern leg of the intersection.

Petaluma Boulevard North/East Washington Street is a signalized, four-legged intersection with protected left-turn phasing on all approaches. Marked crosswalks and pedestrian signals are provided across all four legs.

East Washington Street/North Water Street is a four-legged stop-controlled intersection. The eastbound and westbound East Washington Street approaches are uncontrolled while the southbound North Water Street approach is stop-controlled. The south leg of Water Street is a one-way street in the southbound direction. A crosswalk is provided on the south leg of the intersection.

East Washington Street/Lakeville Street is a signalized, four-legged intersection with split phasing on the Lakeville Street approaches (in other words, the two approaches operate separately) and protected left-turn phasing on the East Washington Street approaches. The SMART/Northwest Pacific Railroad tracks run parallel to and along the west side of Lakeville Street and pass through the western East Washington Street leg of the intersection. Railroad signal infrastructure and crossing arms are located across the East Washington Street legs. Marked crosswalks and pedestrian signals are provided on all legs of the intersection.

East Washington Street/US 101 Southbound Ramps is a signalized, four-legged intersection. Sidewalks and a marked crosswalk are provided along the south side of East Washington Street, with no other pedestrian facilities at this intersection. The intersection was recently upgraded to include a second westbound left-turn lane.

East Washington Street/US 101 Northbound Ramps is a signalized tee-intersection. Modifications to the intersection were recently completed that realign the intersection, removing the westbound left-turn movement to US 101 Northbound and replacing it with a westbound right-turn movement to a new on-ramp.

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 October 1, 2008 through September 30, 2013.

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 *2012 Collision Data on California State Highways*, California Department of Transportation (Caltrans). The collision rate calculations are provided in Appendix A.

Table 1 – Collision Rates at the Study Intersections

Study Intersection	Number of Collisions (2008-2013)	Calculated Collision Rate (c/mve)	Statewide Average Collision Rate (c/mve)
1. Old Redwood Hwy/US 101 SB Ramps	17	**0.33**	0.27
2. Old Redwood Hwy/US 101 NB Ramps	14	0.25	0.27
3. Petaluma Blvd N/Lakeville St	4	0.11	0.27
4. Petaluma Blvd N/Oak St	2	0.07	0.18
5. Petaluma Blvd N/East Washington St	41	**0.75**	0.27
6. E Washington St/N Water St	12	**0.38**	0.15
7. E Washington St/Lakeville St	47	**0.97**	0.27
8. E Washington St/US 101 SB Ramps	31	**0.42**	0.27
9. E Washington St/US 101 NB Ramps	33	**0.44**	0.21

Note: c/mve = collisions per million vehicles entering

The following six study intersections were found to have collision rates higher than the statewide average for similar facilities.

Old Redwood Highway/US 101 Southbound Ramps had 17 reported collisions with a resulting collision rate of 0.33 collisions per mission vehicles entering (c/mve), which is slightly higher than the statewide average of 0.27 c/mve for similar facilities. Construction at the intersection has created changing conditions over the past several years. Historic collision data may not be applicable with the improved configuration. However, the most common collisions were rear-ends with the most common corresponding primary collision factor of unsafe speeds. Improved progression with the increased capacity may decrease collisions.

Petaluma Boulevard/East Washington Street had 41 reported collisions with a resulting collision rate of 0.75 c/mve, which is greater than the statewide average of 0.27 c/mve for similar facilities. The most common collisions were rear-ends with the most common corresponding primary collision factor being unsafe speeds. This type of incident is typical where there is congestion. The second most common collision, accounting for a little less than half of the total, was sideswipes. Two-thirds of the reported sideswipes occurred on the northbound approach, near the transition from on-street parking to a right-turn lane. This repetition could indicate the need to restrict parking further south of the intersection.

Approximately forty percent of the collisions that occurred at **East Washington Street/North Water Street** were broadside collisions, with southbound vehicles turning onto East Washington Street colliding with vehicles going either eastbound or westbound. While a preponderance of broadside collisions may indicate need for a signal, there were a maximum of three such crashes in a 12-month period, and none were reported in the last two years of the five-year study period, so there does not appear to be an ongoing safety problem that would warrant a signal. It is understood that signage is planned to be installed on the median islands on East Washington Street at Water Street that prohibits eastbound left-turn movements; also, southbound left-turn and through movements from North Water Street will be prohibited during peak periods in order to limit conflicts when there are higher volumes on East Washington Street. These measures should address the primary collision trend.

East Washington Street/Lakeville Street experienced 47 reported collisions during the five-year period, for a calculated collision rate of 0.97 c/mve, which is greater than the statewide average of 0.27 c/mve for similar facilities. While Lakeville Street/East Washington Street had an above-average calculated collision rate, the City recently replaced the protected-permitted left-turn phasing at the intersection with protected-only left-turn phasing. Since about one-fourth of the reported crashes involved left turns on East Washington Street, this change is expected to reduce collisions.

East Washington Street/US 101 Southbound ramps had a reported 31 collisions with a resulting collision rate of 0.44 c/mve compared to the statewide average of 0.27 c/mve. Based on the collision records, the most common primary collision factor was unsafe speed resulting in mostly rear-ends. This is common for similar facilities where congestion occurs during peak periods.

East Washington Street/US 101 Northbound ramps had a reported 33 collisions with a resulting collision rate of 0.44 c/mve compared to the statewide average of 0.21 c/mve. Based on reported collisions, the most common type of collision was rear-ends due to unsafe speeds. Recently completed improvements that realigned the intersection to eliminate the westbound left-turn movement and alleviate congestion is expected to improve safety at the intersection.

Alternative Modes

Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site. Existing gaps and obstacles along the connecting roadways impact convenient and continuous access for pedestrians and present safety concerns in those locations where appropriate pedestrian infrastructure would

address potential conflict points. Currently, pedestrian facilities only exist on Petaluma Boulevard along the western border of the project site.

Bicycle Facilities

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

- **Class I Multi-Use Path** – a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- **Class II Bike Lane** – a striped and signed lane for one-way bike travel on a street or highway.
- **Class III Bike Route** – signing only for shared use with motor vehicles within the same travel lane on a street or highway.

In the project area, Petaluma Boulevard North is designated as a Class III bike route between Kent Street and Prospect Street. Local streets near the project area, including Kent Street, Oak Street, and Prospect Street currently do not have any designated bicycle facilities though they also support bicycle circulation in the area. Table 2 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the City of Petaluma's *Bicycle and Pedestrian Master Plan*.

Table 2 – Bicycle Facility Summary

Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
Lynch Creek Trail*	I	0.19	Lakeville St	Water St
Petaluma Blvd	III	0.37	Lakeville St	E Washington St
Lakeville St	III	0.46	E Washington St	Petaluma Blvd
East Washington St	III	0.23	Lakeville St	Petaluma Blvd
Planned				
Oak St	II	0.14	Petaluma Blvd	Copeland St
Water St	I	0.31	Western Ave	Lakeville St

Source: *City of Petaluma Bicycle and Pedestrian Master Plan,* Petaluma Pedestrian and Bicycle Advisory Committee, 2008
*Includes Class I multi-use path bridge over the Petaluma River

Transit Facilities

Petaluma Transit provides fixed route bus service in the City of Petaluma. Petaluma Transit Routes 1 and 5 provide loop service to destinations throughout the City with stops near the project site at Petaluma Boulevard North/Oak Street and Petaluma Boulevard North/East Washington Street. Route 1 operates Monday through Saturday with approximately one-hour headways between 8:00 a.m. and 5:30 p.m. Route 5 operates Monday through Friday with approximately one-hour headways between 6:30 a.m. and 4:30 p.m.

Sonoma County Transit provides regional service between Petaluma and surrounding communities. Route 48, which travels between the City of Petaluma and City of Sonoma, has stops at Petaluma Boulevard North/Oak Street and Petaluma Boulevard/East Washington Street, and operates Monday through Friday with approximately one-hour headways between 5:30 a.m. and 9:30 p.m.

Golden Gate Transit provides regional service between communities in the North Bay Area and San Francisco. Route 74 is a commuter bus route with limited service that operates Monday through Friday, heading toward San Francisco during the morning peak period and back toward Petaluma during the evening commute with approximately one-half-hour headways. Bus stops are located at Petaluma Boulevard North/East Washington Street.

Two bicycles can be carried on most Petaluma Transit, Sonoma County, and Golden Gate Transit buses. Bike rack space is available on a first-come, first-served basis. Additional bicycles are allowed on Petaluma Transit 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. Paratransit is designed to serve the needs of individuals with disabilities within Petaluma and the greater Petaluma area.

The project site is located within one-half mile and to the west of the Sonoma-Marin Area Rail Transit (SMART) Corridor and the Petaluma downtown station located at the historic train station. SMART, at buildout, will provide rail service within Sonoma and Marin counties, extending to Cloverdale to the north and Larkspur to the south, connecting with the Larkspur Ferry Terminal. Along with commuter rail service and a multi-use pathway is planned to be installed parallel to the rail corridor. The first phase of rail service running between San Rafael and Santa Rosa is expected to begin in 2017.

Capacity Analysis

Intersection Level of Service Methodologies

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

The study intersections were analyzed using methodologies published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2000. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle.

The Levels of Service for the 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 intersections that are currently controlled by a traffic signal, or may be in the future, were evaluated using the signalized methodology from the HCM. This methodology is based on factors including traffic volumes, green time for each movement, phasing, whether or not the signals are coordinated, 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 optimized signal timing.

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

Table 3 – Intersection Level of Service Criteria

LOS	Two-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. 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 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 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 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 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 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

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

Traffic Operation Standards

The *Petaluma General Plan 2025 Draft Environmental Impact Report*, 2006, contains the following City Roadway and Intersection Impact Criteria used in its analysis:

> *"The City's current level of service standard is LOS C. Based on existing CEQA and City of Petaluma standards, traffic impacts are identified as significant if the project would cause:*
>
> 1. *Operations (LOS) at a signalized intersection to deteriorate from an acceptable level (LOS C or better) under conditions without the project to an unacceptable level (LOS D, E, or F);*
> 2. *For signalized intersections that operate at an LOS D or E under conditions without the project, the LOS to deteriorate to the next lowest level;*
> 3. *For signalized intersections operating at LOS F without the project, any additional vehicle trips to the intersection;*
> 4. *For unsignalized intersections operating acceptably (LOS C or better) under conditions without the project, the LOS to deteriorate to unacceptable (LOS D, E, or F) conditions AND the traffic volumes at the intersection would satisfy the Caltrans peak-hour volume warrant criteria for traffic signal installation; or*
> 5. *For unsignalized intersections operating at unacceptable levels (LOS D, E, or F) under conditions without the project, average delay to increase by five or more seconds AND the traffic volumes at the intersection would satisfy the Caltrans peak-hour volume warrant criteria for traffic signal installation."*

However, the *Petaluma General Plan 2025* adopted a Level of Service (LOS) standard for streets that indicates the minimum acceptable operation is LOS D, with the following standard of significance for motor vehicle circulation:

> ***Policy 5-P-10:*** *Maintain an intersection level of service (LOS) standard for motor vehicle circulation that ensures efficient traffic flow and supports multi-modal mobility goals. LOS should be maintained at Level D or better for motor vehicles due to traffic from any development project.*

With the current General Plan, the City is shifting toward a multimodal emphasis and LOS standard. "A multimodal analysis that, in addition to motor vehicles, takes into consideration the overall mobility and conditions for non-auto road users (i.e., bicycles and pedestrians) is highly encouraged." The Community Character Element of the General Plan also contains circulation-related objectives and policies. This element directs that pedestrian and bicycle circulation be integrated into street designs and improvements. It also states that the amount of paving and the apparent width of streets should be reduced where possible.

Caltrans

Although located within Petaluma city limits, Caltrans has jurisdiction over four of the study intersections, as they are located on a ramp connecting to a state highway. Caltrans indicates that they endeavor to maintain operation at the transition from LOS C to LOS D. Where intersections are integral to a local jurisdictions transportation system, Caltrans often accepts the operational standard applied by the local agency, in this case, the City of Petaluma.

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. Volume data was collected August 26, 2014 and August 27, 2015; local schools were in session on both dates.

Turn restrictions at East Washington Street/North Water Street as required of the Brewster's Garden project were assumed to be in effect for the purpose of this analysis as detailed in the Collision History section.

Intersection Levels of Service

Under existing conditions, the study intersections are operating acceptably at LOS D or better overall during both the a.m. and p.m. peak hours. A summary of the intersection level of service calculations is contained in Table 4. The existing traffic volumes are shown in Figure 2, and copies of the Level of Service calculations are provided in Appendix B.

Table 4 – Existing Peak Hour Intersection Levels of Service

Study Intersection *Approach*	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
1. Old Redwood Hwy/US 101 SB Ramps	15.6	B	14.3	B
2. Old Redwood Hwy/US 101 NB Ramps	8.4	A	5.7	A
3. Petaluma Blvd N/Lakeville St	10.8	B	12.6	B
4. Petaluma Blvd N/Oak St	1.8	A	2.2	A
Eastbound Approach	*24.0*	*C*	*29.4*	*D*
5. Petaluma Blvd N/E Washington St	26.8	C	28.4	C
6. N Water St/E Washington St	0.0	A	0.3	A
Southbound Approach	*10.7*	*B*	*10.8*	*B*
7. E Washington St/Lakeville St	24.6	C	36.6	D
8. E Washington St/US 101 SB Ramps	26.5	C	30.4	C
9. E Washington St/US 101 NB Ramps	6.9	A	17.5	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*

US 101 Study Segments

The portions of US 101 between Old Redwood Highway and East Washington Boulevard, East Washington Boulevard and Lakeville Highway, and Lakeville Highway and Petaluma Boulevard South currently carry approximately 98,000 vehicles per day according to data published by Caltrans on their website. Table 5 shows how many vehicles travel through each study segment during the a.m. and p.m. peak hours.

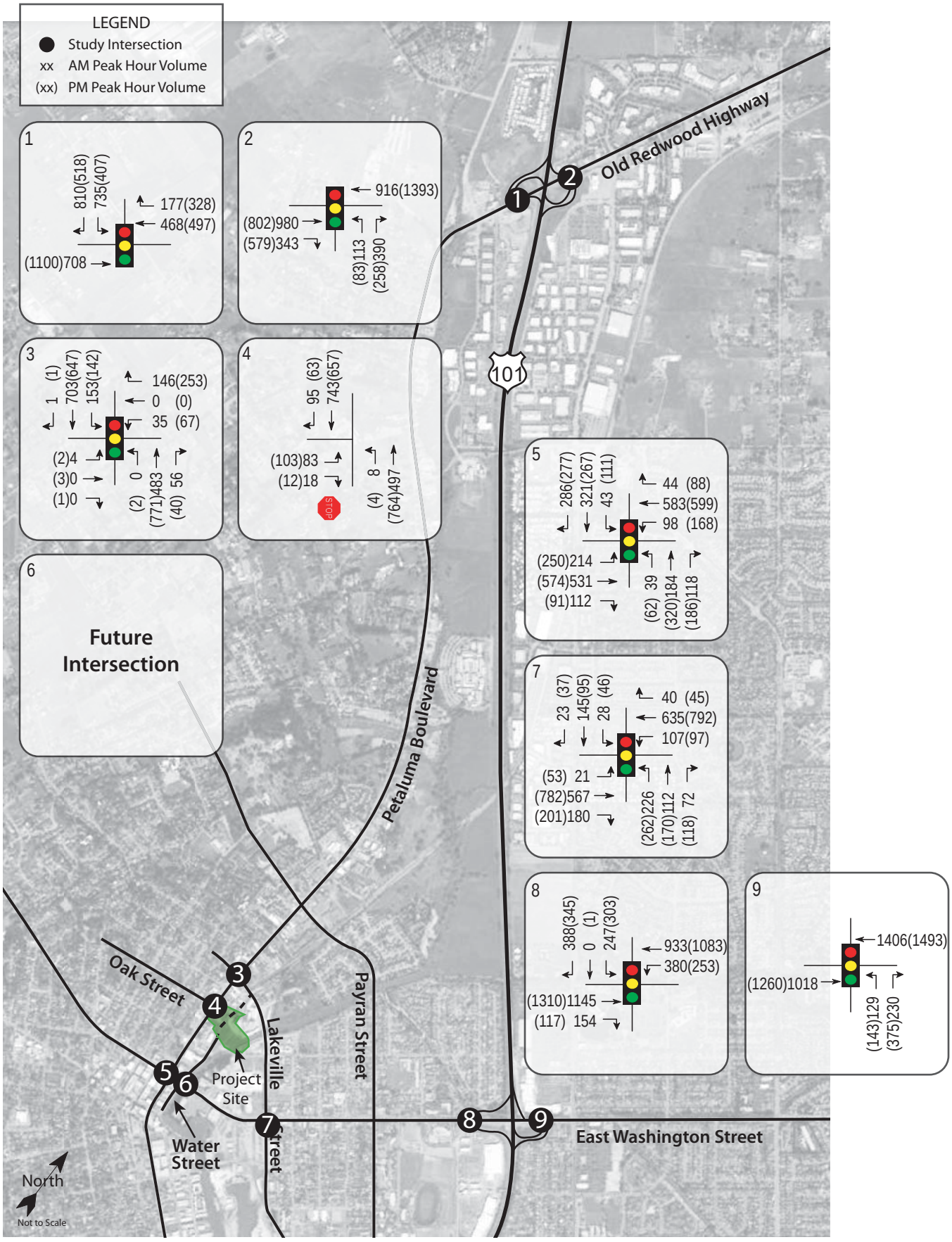
Table 5 – Existing Highway Segment Peak Hour Volumes

US 101 Segment	NB Volume		SB Volume	
	AM Peak	PM Peak	AM Peak	PM Peak
Old Redwood Hwy – E Washington Blvd	1,100	4,050	4,700	3,150
E Washington Blvd – Lakeville Hwy	3,950	4,930	4,850	3,870
Lakeville Hwy – Petaluma Blvd S	3,550	4,420	4,350	3,480

Source: *2013 All Traffic Volumes on California State Highway System*, Traffic Data Branch, Caltrans

Existing plus Pipeline Conditions

Existing plus Pipeline operating conditions were assessed to reflect the addition of traffic associated with known projects that may be constructed and/or become operational in the study area in the next two to three years. City Staff identified the following projects to be included in this scenario.



200pet.ai 1/17

Traffic Impact Study for the North River Apartments

Figure 2 – Existing Traffic Volumes

- **East Washington Street Signal Timing and Coordination** – planned and funded improvement project through grants awarded by the Sonoma County Transportation Authority (SCTA) and the Bay Area Air Quality Management District (BAAQMD) to update traffic signal timing and coordination along the East Washington Street corridor, with implementation expected in summer 2016.
- **Lynch Creek Plaza** – 22,500 square feet of retail at Lynch Creek Way and North McDowell Boulevard
- **Riverfront 2010** – 273 residential units, 120-room hotel, up to 60,000 square feet of office and 30,000 square feet of retail/service space
- **Deer Creek Village** – Approximately 345,000 square feet of commercial center located on North McDowell Boulevard between Lynch Creek Way and Rainier Avenue (50 percent constructed/occupied when counts were taken)
- **Keller Court Commons** – 8 single-family homes located on West Street at Keller Street
- **Davidon Homes** – 93 single family residential subdivision on Windsor Drive and D Street
- **Petaluman Hotel** – 57-room hotel located at 2 Petaluma Boulevard South
- **Maria Drive Apartments** – 144-unit apartment complex to be located at 35 Maria Drive
- **Addison Ranch Apartments** – 100 multi-family units in an existing apartment complex located at 200 Greenbriar Circle
- **Petaluma Poultry** – 24-hour production facility at the southwest corner of Lakeville Highway and McDowell Boulevard South
- **Safeway Fuel Center** – Gas station with 8 fueling stations and convenience market at 335 South McDowell Boulevard
- **North McDowell Commons** – 34 residential units located on North McDowell Boulevard
- **Avila Ranch Subdivision** – 21 single-family homes located at 511 Sonoma Mountain Parkway
- **Quarry Heights** – 136 single family homes located in southwest Petaluma
- **Sid Commons** – 282-unit apartment complex located at the end of Graylawn Avenue at the Petaluma River
- **Sunny Slope II** – 18 single family homes located on Sunnyslope Road
- **Pinnacle Ridge** – 11 single family homes located at 2762 I Street
- **Haystack Landing** – Mixed-use development with 21,111 square feet of commercial space, 120 units of apartments units, and 31 units of senior adult housing located between Copeland Street and Weller Street
- **Ferrin Subdivision** – 11 single-family homes located at 2832 I Street
- **Cader Corporate Center** – 267,840 square feet of light industrial space
- **Cader Lane Industrial Park** – 241,000 square feet of light industrial space
- **Marina Apartments** – 90-unit apartment complex located on the northwest corner of the Petaluma Marina
- **Brewster's Garden** – New restaurant with average seating of 111 patrons and maximum of 300 patrons at 242 and 238 Petaluma Blvd North
- **Adobe Animal Hospital** –3,900 square-foot veterinary clinic at 408 Madison Street
- **River Bend Crossing**– 113 attached residential units located along the Petaluma River to the north of Central Petaluma
- **Brody Ranch Subdivision** – 60 single family dwellings and 138 apartments at the southwest corner of Corona Road/Sonoma Mountain Parkway
- **Leghorn Plaza** – 9,360 square feet of commercial space an existing shopping center off of Sonoma Mountain Parkway and Riesling Road
- **Petaluma Silk Mill Hotel Renovation** – 76-room hotel to be located at 450 Jefferson Street
- **Burdell Building Condos** – 24 condominiums located at Lakeville Street/D Street
- **Altura Apartments** – 150-unit apartment complex to be located at the northwest corner of Baywood Drive/ Perry Lane
- **The Block Food Park** – Outdoor restaurant and food truck market with average seating of 85 patrons at 101 East Washington Street
- **East Washington Commons** – 24 apartments at 817-825 East Washington Street
- **Labcon Distribution Facility** – 40,000 square feet of warehousing at 3200 Lakeville Highway

Turn restrictions at East Washington Street/North Water Street were assumed to be in effect for the purpose of this analysis as detailed in the Collision History section.

The projected traffic associated with these projects was added to the volumes analyzed in the "Existing Conditions" scenario in order to determine Existing plus Pipeline volumes. Under these conditions, the study intersections are projected to continue operating acceptably at LOS D or better, except Lakeville Street/East Washington Street, which is expected to operate unacceptably at LOS E during the p.m. peak hour. Existing plus Pipeline operating conditions are summarized in Table 6, and Existing plus Pipeline traffic volumes are shown in Figure 3.

Table 6 – Existing plus Pipeline Peak Hour Intersection Levels of Service

Study Intersection		**AM Peak**		**PM Peak**	
	Approach	**Delay**	**LOS**	**Delay**	**LOS**
1.	Old Redwood Hwy/US 101 SB Ramps	15.8	B	14.3	B
2.	Old Redwood Hwy/US 101 NB Ramps	8.6	A	5.7	A
3.	Petaluma Blvd N/Lakeville St	12.1	B	15.3	B
4.	Petaluma Blvd N/Oak St	1.8	A	2.3	A
	Eastbound Approach	*25.7*	*D*	*33.2*	*D*
5.	Petaluma Blvd N/E Washington St	34.3	C	38.4	D
6.	N Water St/E Washington St	0.0	A	0.2	A
	Southbound Approach	*11.1*	*B*	*10.2*	*B*
7.	E Washington St/Lakeville St	41.7	D	**71.4**	**E**
8.	E Washington St/US 101 SB Ramps	33.2	C	43.8	D
9.	E Washington St/US 101 NB Ramps	8.4	A	14.0	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*; **Bold** text = deficient operation

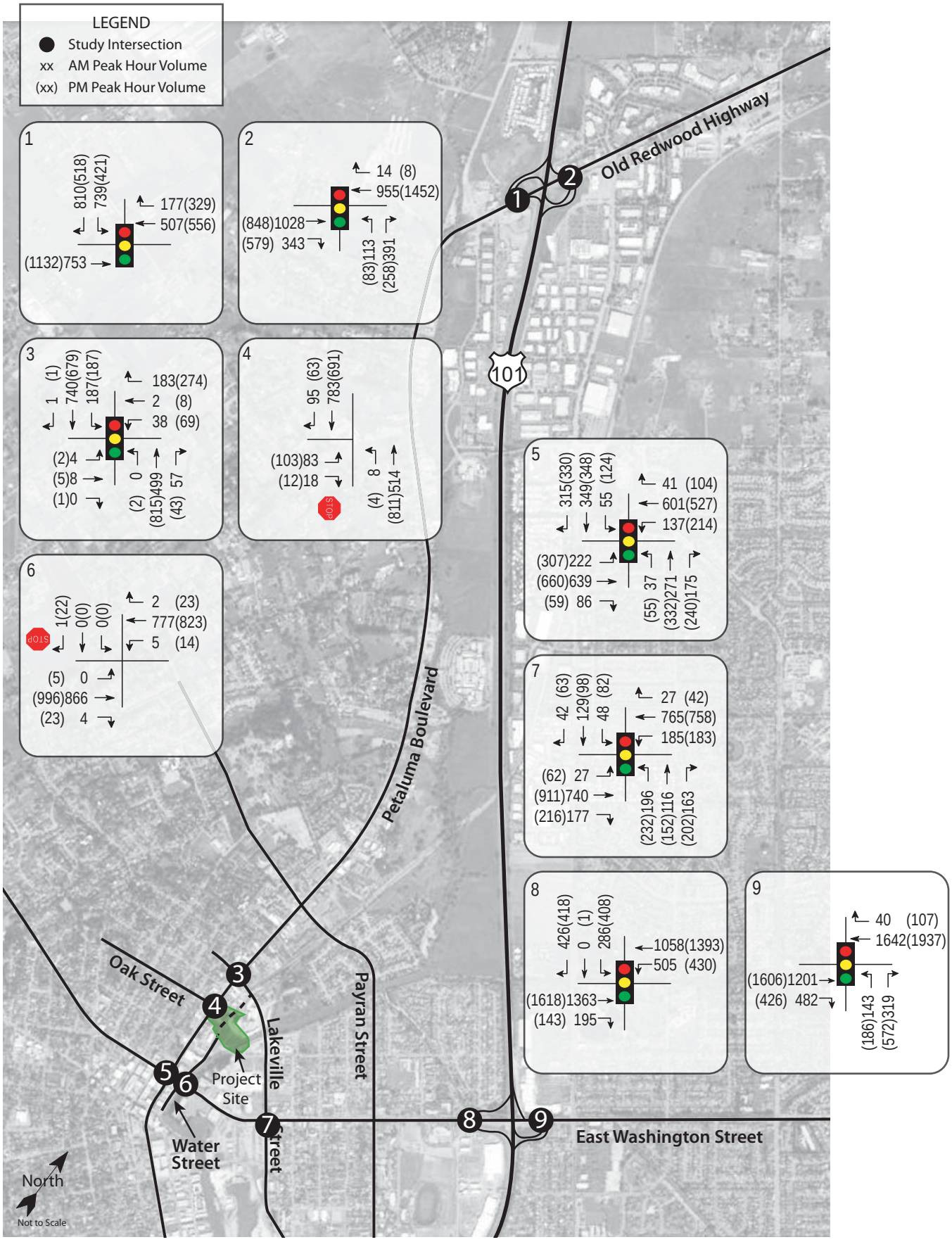
Cumulative Conditions

The Cumulative Conditions scenario presents a review of the correlation between the project and the Petaluma General Plan. The City of Petaluma has developed a Traffic Model for use in evaluating the potential traffic impacts of buildout of the land uses described in the General Plan together with new or improved streets. Buildout of the City's General Plan is not expected to occur by the year 2025 because of economic conditions in the recent past, and would not be exceeded in this timeframe due to the City's adopted urban growth boundary (UGB). The horizon year for the projections can therefore be considered to be *at least* 2035.

Per the *Central Petaluma Specific Plan*, North Water Street is a planned north-south connector that would extend the existing roadway, which currently intersects East Washington Street to the south, to the north, terminating at Lakeville Street.

Cumulative peak hour volumes were taken from Figure 3-2-8 in the Petaluma General Plan for the intersections of Old Redwood Highway/US 101 Southbound Ramps, Old Redwood Highway/US 101 Northbound Ramps, and Petaluma Boulevard North/Lakeville Street.

Cumulative volumes for the intersection of East Washington Street/Lakeville Street were obtained from the *Riverfront 2010 EIR*.



200pet.ai 1/17

Traffic Impact Study for the North River Apartments

Figure 3 – Existing plus Pipeline Traffic Volumes

Cumulative traffic forecasts for East Washington Street/US 101 Southbound ramps, East Washington Street/US 101 Northbound Ramps, and Petaluma Boulevard North/East Washington Street were obtained from the *East Washington Place EIR Traffic Study,* March 2011. These projections were developed through the use of the City's traffic model, and with the assumption that the Rainier Interchange would be constructed, providing an east-west crossing of US 101 along with a mid-city connection to US 101.

Cumulative volumes at Petaluma Boulevard North/Oak Street were determined by applying a growth factor of 1.16 to existing volumes, which was developed by comparing Existing volumes to volumes contained within the City's traffic model. Peak hour volumes for East Washington Street/North Water Street were developed using the cumulative approach volumes at East Washington Street/Petaluma Boulevard and applied to East Washington Street/North Water Street based on existing turning movement ratios.

Network signal timing on the East Washington Street corridor for the Existing plus Pipeline scenario was also used in analyzing the Cumulative scenario.

Cumulative Intersection Operation

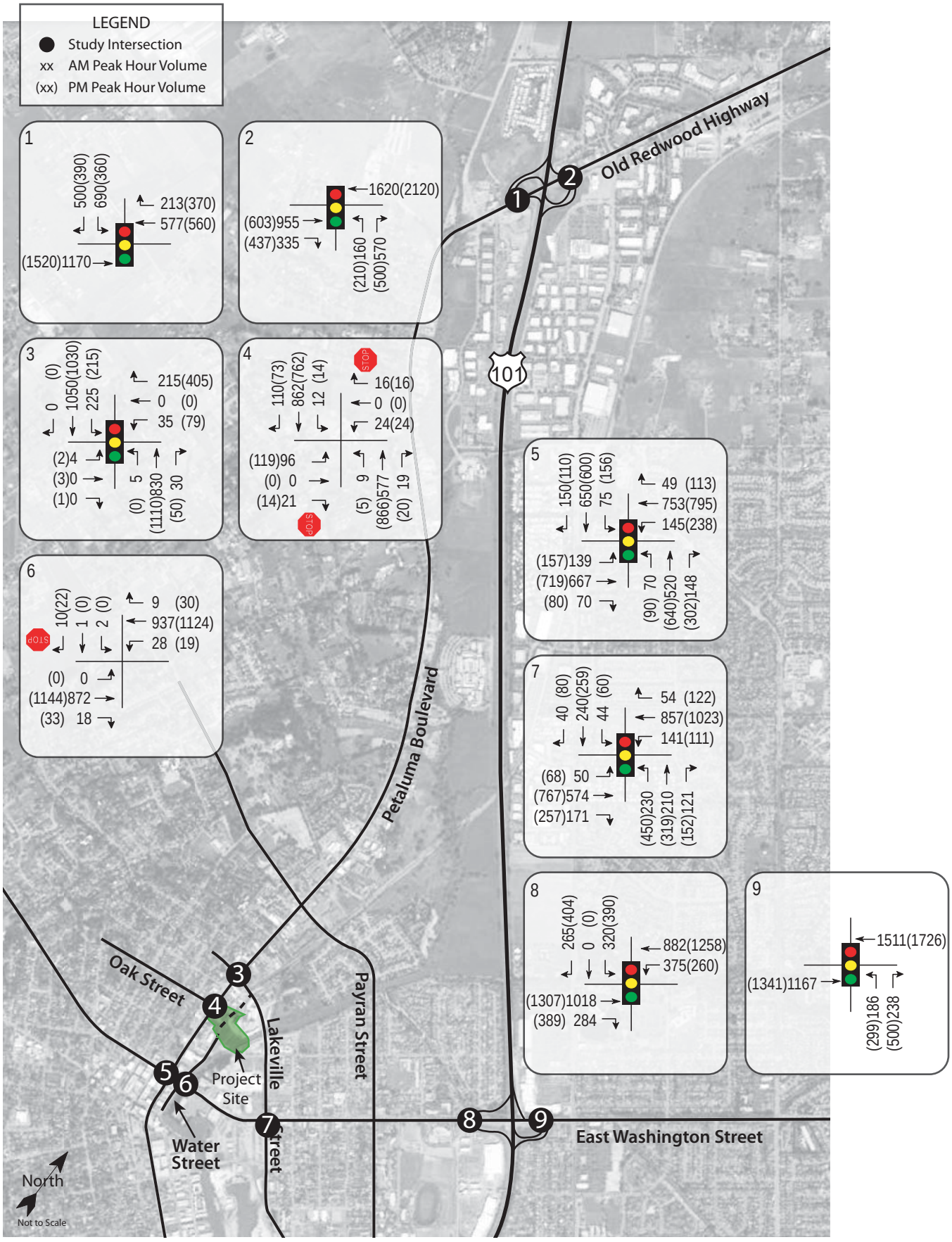
East Washington Street/Lakeville Street was identified in the City's General Plan as operating acceptably under cumulative conditions. However, recent safety-related changes to the signal phasing have reduced efficiency, resulting in projected LOS E operation under cumulative volumes during the p.m. peak period. Turn restrictions at East Washington Street/North Water Street were assumed to be in effect for the purpose of this analysis as detailed in the Collision History section.

Under the anticipated cumulative volumes, the study intersections are expected to operate acceptably except for East Washington Street/Lakeville Street, which is expected to operate at LOS E during both peak hours. Petaluma Boulevard North/Oak Street is expected to operate deficiently overall at LOS F during the p.m. peak hour, with LOS F operation on both the eastbound and westbound approaches during both peak hours. A traffic signal warrant analysis was conducted for the Petaluma Boulevard North/Oak Street and is discussed in further detail later in this report. Cumulative operating conditions are summarized in Table 7, and volumes are shown in Figure 4.

Table 7 – Cumulative Peak Hour Intersection Levels of Service

Study Intersection		**AM Peak**		**PM Peak**	
	Approach	**Delay**	**LOS**	**Delay**	**LOS**
1.	Old Redwood Hwy/US 101 SB Ramps	13.1	B	11.7	B
2.	Old Redwood Hwy/US 101 NB Ramps	11.8	B	11.1	B
3.	Petaluma Blvd N/Lakeville St	13.4	B	19.1	B
4.	Petaluma Blvd N/Oak St	26.1	D	**	**F**
	Eastbound Approach	**	***F***	**	***F***
	Westbound Approach	***56.5***	***F***	**	***F***
5.	Petaluma Blvd N/E Washington St	50.2	D	52.9	D
6.	E Washington St/N Water St	0.2	A	0.2	A
	Southbound Approach	*14.4*	*B*	*9.3*	*A*
7.	E Washington St/Lakeville St	**61.7**	**E**	**61.1**	**E**
8.	E Washington St/US 101 SB Ramps	18.8	B	26.0	C
9.	E Washington St/US 101 NB Ramps	8.5	A	13.0	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*; ****** indicates delay >120 seconds; **Bold** text = deficient operation



200pet.ai 1/17

Traffic Impact Study for the North River Apartments

Figure 4 – Cumulative Traffic Volumes

Project Description

The project consists of an apartment complex that would include 184 apartment units, 2,984 square feet of retail space, and 1,693 square feet of office on a vacant parcel. The site is bounded by Petaluma Boulevard North to the west of the property, the Petaluma River to the east, and commercial land uses border the north and south. The planned alignment of North Water Street traverses the project in the north-south direction. The two buildings would be accessed via a driveway on either side of North Water Street, south of its new intersection with Oak Street. There is a potential that the North Water Street extension to connect to East Washington Street may not be completed and accessible to residents and patrons of the project site in the near-term; however, North Water Street is ultimately planned, per the Central Petaluma Specific Plan, to extend from East Washington Street to Lakeville Street. The Existing plus Project and Existing plus Pipeline plus Project scenarios were evaluated considering several North Water Street access conditions. The proposed project site plan is shown in Figure 5.

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*, 9th Edition, 2012 for "Apartment" (ITE LU 220) to calculate daily trips and "Mid-Rise Apartment" (ITE LU 223) to calculate a.m. and p.m. peak hour trips. The "Mid-Rise Apartment" land use designation was determined to be the most appropriate for urban apartment developments and is applied for apartment buildings between three and ten levels, which aligns with the project building size, but does not have a daily rate. The trip generation for the retail component was estimated for daily and p.m. peak hour trips using "Specialty Retail Center" (ITE LU 826) and for a.m. peak hour trips using "Shopping Center" (ITE LU 820). The Specialty Retail Center land use designation is generally more appropriate for use in estimating trips for small retail spaces, but does not have an a.m. peak hour rate. "General Office Building" (ITE LU 710) was used for the proposed office space.

The expected trip generation potential for the proposed project is indicated in Table 8. The proposed project is expected to generate an average of 1,375 trips per day, including 61 trips during the a.m. peak hour and 83 during the p.m. peak hour.

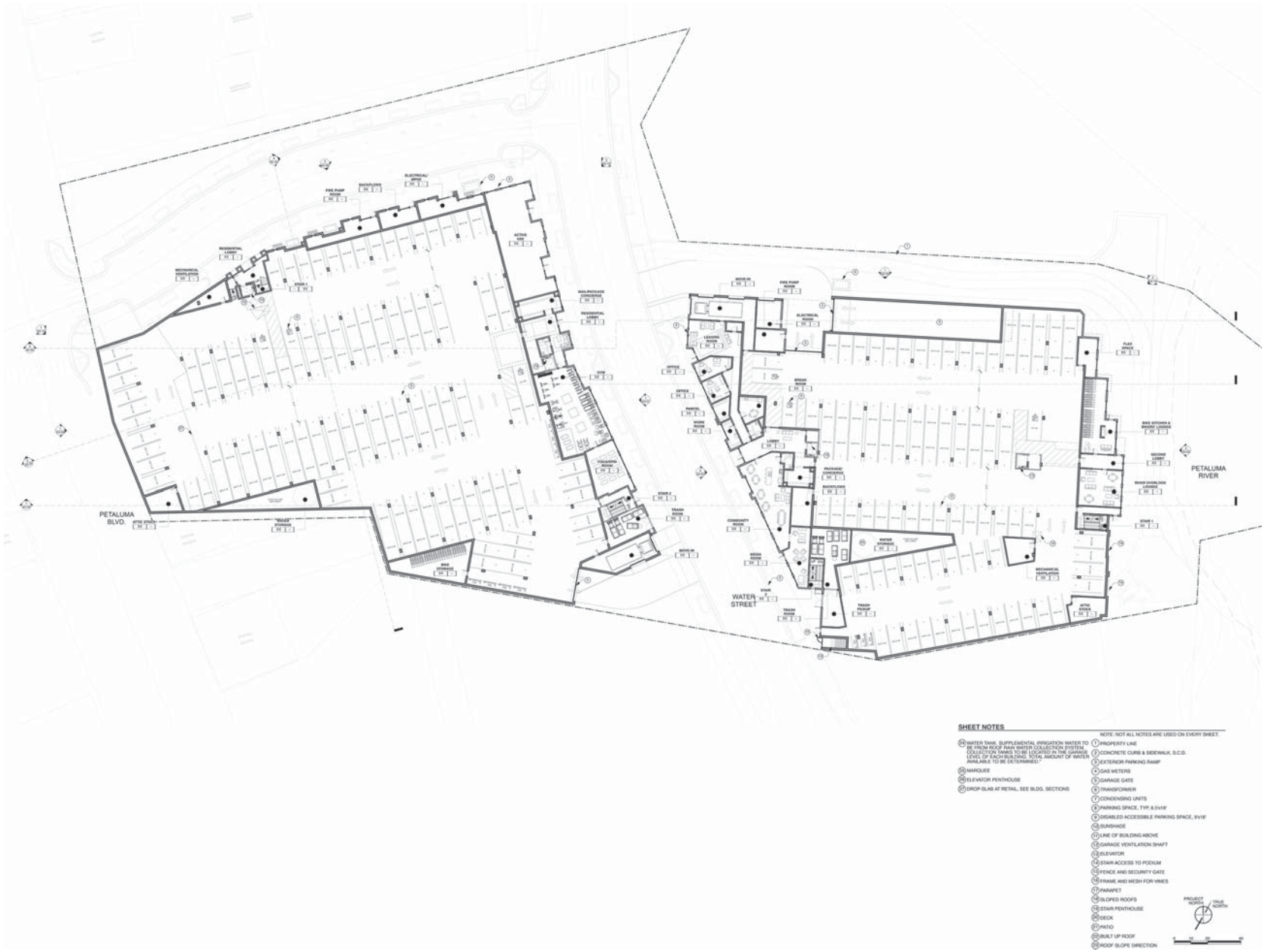
Table 8 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Proposed											
Apartment	184 du	6.65	1,224	0.30	55	17	38	0.39	72	42	30
Retail	2.984 ksf	44.32	132	0.96	3	2	1	2.71	8	4	4
Office	1.693 kfs	11.03	19	1.56	3	2	1	1.49	3	0	3
Total Trips			**1,375**		**61**	**21**	**40**		**83**	**46**	**37**

Note: du = dwelling unit; ksf = 1,000 square feet

Trip Distribution

The project's anticipated trip distribution was developed by first breaking down the percentages of regional versus local trips based on 2010 Census journey-to-work data, which indicates that approximately 61 percent of traffic is oriented to locations outside of Petaluma, with the remaining 39 percent remaining in the City. Regional trips were assigned to US 101, Lakeville Highway, and Bodega Avenue based on the journey-to-work data. In the case of US 101 trips, drivers from the project site have several driving route options. For instance, some drivers destined to US 101 South would use East Washington Street, some would use Lakeville Street, and some would use Petaluma Boulevard South to the Kastania Road interchange. Travel times are generally similar among the



Source: BDE Architecture 8/16

Traffic Impact Study for the Noth River Apartments

Figure 5 – Site Plan

three routes, though the shortest connection to the freeway is via East Washington Street. It should be noted that trip distribution routes consider the prevailing travel patterns expected to occur during the various analysis periods, recognizing that temporary influences on route choice such as construction on US 101 through the Marin Sonoma Narrows may occur.

Local trips made within the City of Petaluma were distributed to the roadway network based on current and anticipated travel patterns, as well as the locations of attractors such as employment areas, schools, and shopping. Project-generated traffic was assigned along expected paths of travel, including some via streets in the Oak Hill neighborhood, as described in further detail under the "Effect of the Signalization of Petaluma Boulevard North/Oak Street" section later in the report. The applied distribution assumptions and resulting trips are shown in Table 9.

Table 9 – Trip Distribution Assumptions

Route	Percent	Daily Trips	AM Trips	PM Trips
Regional Distribution				
US 101 N				
via Petaluma Boulevard North	12%	165	7	10
via East Washington Street	4%	55	2	3
US 101 S				
via Petaluma Boulevard South	14%	193	9	12
via East Washington Street	23%	316	14	19
via Lakeville Highway	2%	28	1	2
Lakeville Highway	3%	41	2	2
Bodega Avenue	3%	41	2	2
Total Regional	61%	839	37	50
Local Distribution				
Petaluma Blvd N – North of Lakeville St	10%	138	6	8
Petaluma Blvd S – South of E Washington St	6%	82	4	5
E Washington St – West of Petaluma Blvd	7%	96	4	6
E Washington St – East of Lakeville St	14%	193	9	12
Lakeville St – South of E Washington St	2%	27	1	2
Total Local	39%	538	24	33
TOTAL	**100%**	**1,375**	**61**	**83**

Project Access

The proposed project has three different potential access alternatives planned for the site. These alternatives include the following:

- **Alternative 1** – The project is only accessible via the intersection of Petaluma Boulevard North/Oak Street.
- **Alternative 2** – The project is accessible via Petaluma Boulevard North/Oak Street and East Washington Street/North Water Street (which is restricted to right-turn in/right-turn out movements only).
- **Alternative 3** – The project is accessible via Petaluma Boulevard North/Oak Street, right-in/right-out access at East Washington Street/North Water Street, and right-in/right-out access at Lakeville Street/North Water Street.

Intersection operations were analyzed for Alternatives 1 and 2 for all "plus Project" scenarios. Alternative 3 was only analyzed under cumulative plus project conditions because the North Water Street connection to Lakeville Street is not expected to open in the near-term.

Traffic Operating Conditions

Existing plus Project Conditions

Upon the addition of project-related traffic to the Existing volumes, the study intersections are expected to operate acceptably, except Petaluma Boulevard North/Oak Street, which is expected to operate deficiently overall at LOS E under Alternatives 1 and 2 during the p.m. peak hour. The eastbound and westbound approaches would also operate deficiently at LOS E or LOS F during both peak hours. Signalization of Petaluma Boulevard North/Oak Street is discussed in further detail later in this report. Existing plus Project operation conditions are summarized in Table 10. Alternative 1 project traffic volumes are shown in Figure 6, Alternative 2 project traffic volumes are shown in Figure 7, and Alternative 3 project traffic volumes (evaluated under cumulative conditions only) are shown in Figure 8.

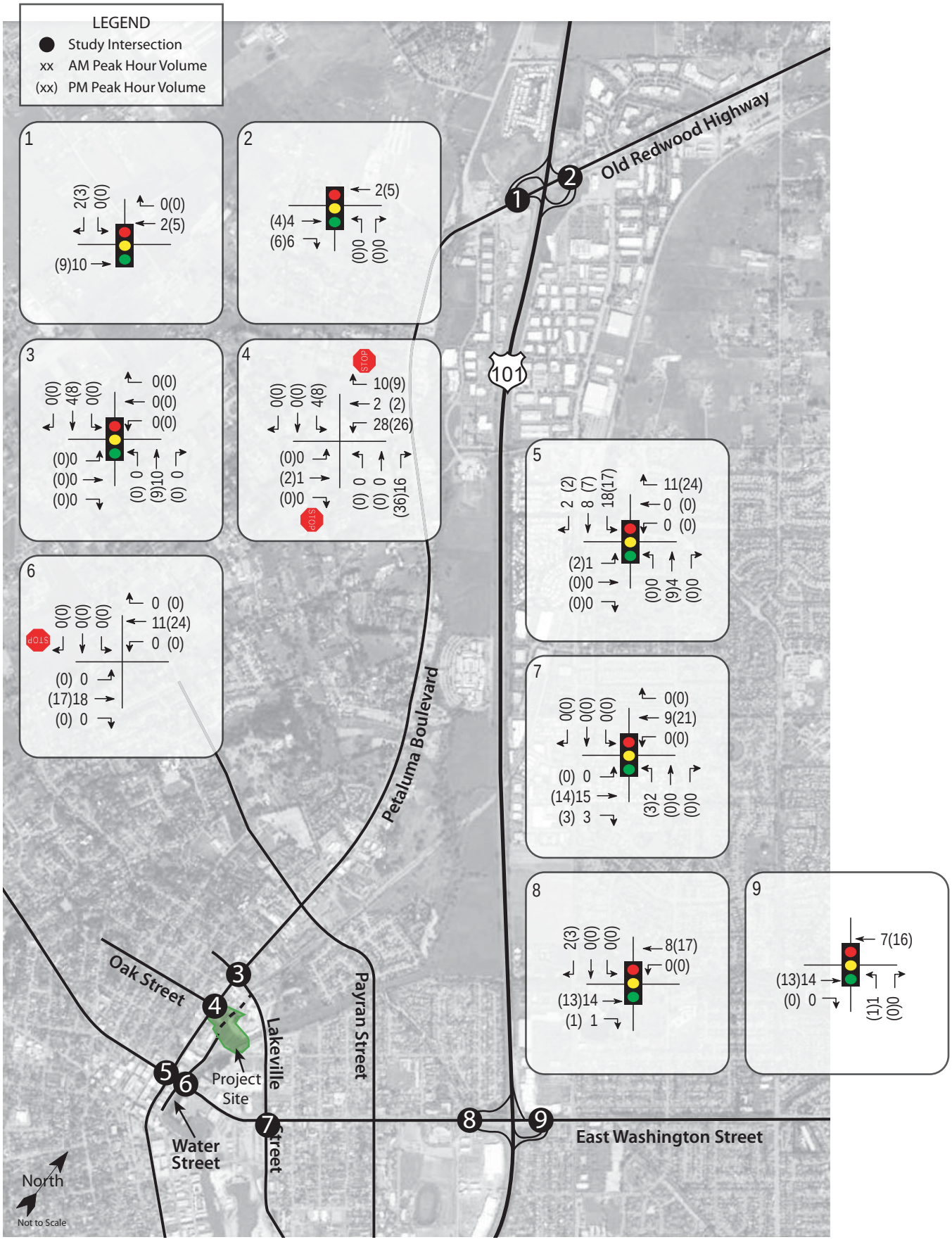
Table 10 – Existing and Existing plus Project (Alternatives 1 and 2) Peak Hour Intersection LOS

	Study Intersection ***Approach***	**Existing Conditions**		**Existing plus Project Alt 1**		**Existing plus Project Alt 2**	
		AM Peak	**PM Peak**	**AM Peak**	**PM Peak**	**AM Peak**	**PM Peak**
1.	ORH/US 101 SB Ramps	15.6/B	14.3/B	15.6/B	14.3/B	15.6/B	14.3/B
2.	ORH/US 101 NB Ramps	8.4/A	5.7/A	8.4/A	5.7/A	8.4/A	5.7/A
3.	Petaluma Blvd N/Lakeville St	10.8/B	12.6/B	10.9/B	12.6/B	10.9/B	12.6/B
4.	Petaluma Blvd N/Oak St	1.8/A	2.2/A	13.3/B	**39.3/E**	13.1/B	**39.2/E**
	Eastbound Approach	*24.0/C*	*29.4/D*	*****/F***	*****/F***	*****/F***	*****/F***
	Westbound Approach	--	--	***50.2/F***	***88.8/F***	***46.0/E***	***74.5/F***
	Mitigated (With Traffic Signal)	--	--	7.2/A	9.0/A	7.2/A	8.8/A
5.	Petaluma Blvd N/E Washington St	26.8/C	28.4/C	28.1/C	29.7/C	27.9/C	29.4/C
6.	E Washington St/N Water St	0.0/A	0.3/A	0.0/A	0.3/A	0.1/A	0.3
	Southbound Approach	*10.7/B*	*10.8/B*	*10.8/B*	*10.8/B*	*10.8/B*	*10.8/B*
7.	E Washington St/Lakeville St	24.6/C	36.6/D	24.6/C	36.9/D	24.6/C	36.9/D
8.	E Washington St/US 101 SB Ramps	26.5/C	30.4/C	26.7/C	31.0/C	26.7/C	31.0/C
9.	E Washington St/US 101 NB Ramps	6.9/A	17.5/B	6.9/A	17.5/B	6.9/A	17.5/B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results are displayed as Delay/LOS; ORH = Old Redwood Highway; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* **Bold** text = deficient operation; ** indicates delay >120 seconds; Shaded cells indicate conditions with recommended mitigation

Finding – The study intersections are expected to continue operating acceptably at the same levels of service overall upon the addition of project-generated traffic to existing volumes, except at Petaluma Boulevard North/ Oak Street. Operation at the study intersections is nearly the same regardless of the availability of a connection to East Washington Street via North Water Street, except delay increases at Petaluma Boulevard North/Oak Street without the connection. Operation would improve at Petaluma Boulevard North/Oak Street to acceptable LOS A during both peak hours with the installation of a traffic signal.

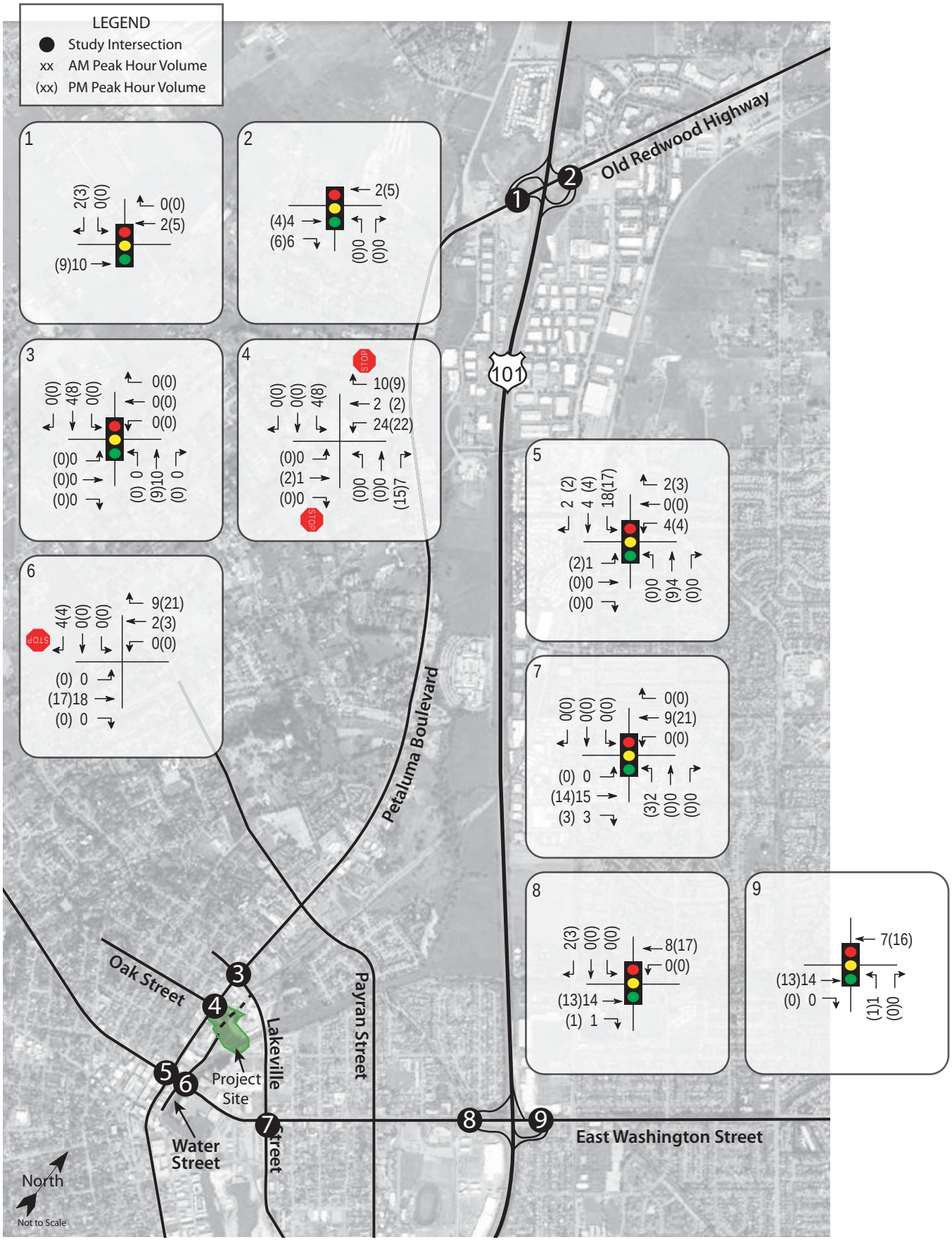
Recommendation – It is recommended that a traffic signal be installed at the intersection of Petaluma Boulevard North/Oak Street.



200pet.ai 1/17

Traffic Impact Study for the North River Apartments

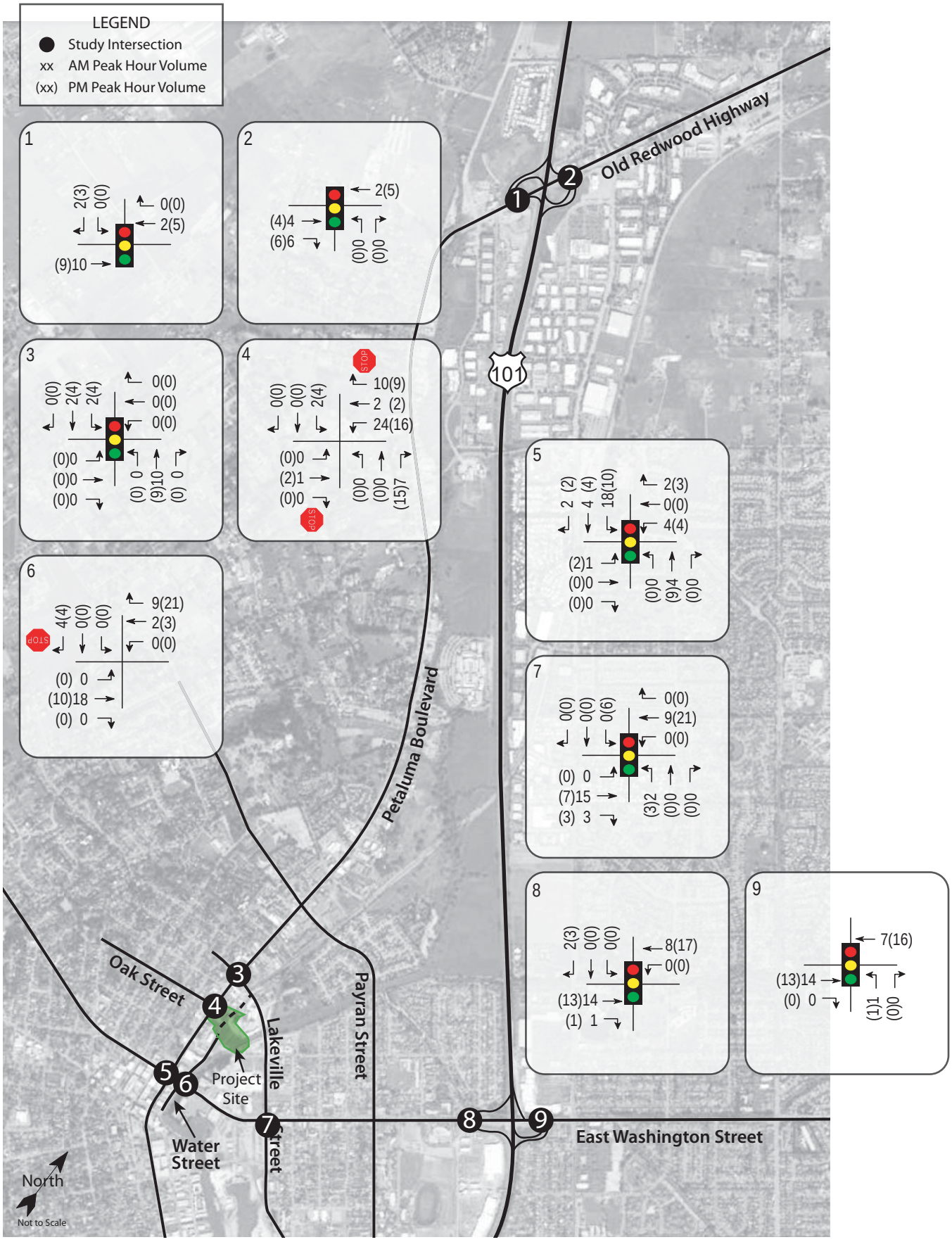
Figure 6 – Project Traffic Volumes: Alternative 1



200pet.ai 1/17

Traffic Impact Study for the North River Apartments

Figure 7 – Project Traffic Volumes: Alternative 2



200pet.ai 1/17

Traffic Impact Study for the North River Apartments

Figure 8 – Project Traffic Volumes: Alternative 3

W-Trans

US 101 Study Segments

The study segments of US 101 currently carry approximately 98,000 vehicles per day. Traffic volumes on the US 101 study segments are expected to be the same under both Existing plus Project Alternative 1 or scenario represents the most conservative assessment of project-related impacts since project trips make up a larger percentage of the existing overall volumes on the highway compared to cumulative volumes. Table 11 shows how many vehicles travel through each study segment during the a.m. and p.m. peak hours under Existing and Existing plus Project conditions and the resulting percent increase in volumes associated with the proposed project.

Table 11 – Existing and Existing plus Project Highway Segment Peak Hour Volumes

US 101 Segment / *Scenario*	NB Volume				SB Volume			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Vol.	% Inc.	Vol.	% Inc.	Vol.	% Inc.	Vol.	% Inc.
Old Redwood Hwy – East Washington Blvd								
Existing	1,100		4,050		4,700		3,150	
Existing + Project	1,105	0.5%	4,056	0.1%	4,705	0.1%	3,160	0.3%
East Washington Blvd – Lakeville Hwy								
Existing	1,100		4,000		4,650		3,150	
Existing + Project	1,103	0.3%	4,006	0.2%	4,655	0.1%	3,155	0.2%
Lakeville Hwy – Petaluma Blvd South								
Existing	1,000		3,500		4,100		2,800	
Existing + Project	1,006	0.6%	3,512	0.3%	4,111	0.3%	2,810	0.4%

Notes: Vol. = volume; % Inc. = percent increase

Improvements are currently under construction along various portions of US 101, including between Lakeville Highway and Petaluma Boulevard South, to add one travel lane in each direction. These lanes will serve as High Occupancy Vehicle (HOV) lanes during the morning and evening peak periods. These improvements are funded in part by a quarter-cent sales tax approved by Sonoma County voters. The added lanes and associated interchange improvements are the only improvements currently planned along US 101 with the exception of the future interchange at Rainier Avenue, though this latter project is currently unfunded.

Finding – Project trips would increase overall directional volumes on any of the three freeway study segments during the peak hours by no more than 0.6 percent. In addition, the segments between Petaluma Boulevard South and Lakeville Highway as well as Lakeville Highway and East Washington Boulevard Lakeville are slated for widening with the Marin Sonoma Narrows project that is currently under construction. Given the increased capacity that will be available once construction is completed and that the project would increase volumes on the freeway segments by less than one percent, the project-related impacts are considered less-than-significant.

Existing plus Pipeline plus Project Conditions

With project-related traffic added to Existing plus Pipeline volumes for Alternatives 1 and 2, the study intersections are expected to operate acceptably at LOS D or better, except for the intersection of Lakeville Street/East Washington Street during the p.m. peak hour, which is expected to operate at LOS E and Petaluma Boulevard North/Oak Street, which is expected to continue operating overall at LOS F during the p.m. peak hour. The eastbound and westbound approaches at Petaluma Boulevard North/Oak Street would operate deficiently at LOS F during both peak hours with both access alternatives. Signalization of Petaluma Boulevard North/Oak Street is discussed in further detail later in this report. These results are summarized in Table 12.

Table 12 – Existing + Pipeline and Existing + Pipeline plus Project Alternatives 1 & 2 Peak Hour Intersection LOS

	Study Intersection *Approach*	Existing plus Pipeline		Existing plus Pipeline plus Project Alt 1		Existing plus Pipeline plus Project Alt 2	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
1.	ORH/US 101 SB Ramps	15.8/B	14.3/B	15.8/B	14.3/B	15.8/B	14.3/B
2.	ORH/US 101 NB Ramps	8.6/A	5.7/A	8.6/A	5.7/A	8.6/A	5.7/A
3.	Petaluma Blvd N/Lakeville St	12.1/B	15.3/B	12.1/B	15.3/B	12.1/B	15.3/B
4.	Petaluma Blvd N/Oak St	1.8/A	2.3/A	17.3/B	**56.0/F**	17.2/B	**55.8/F**
	Eastbound Approach	*25.7/D*	*33.2/D*	***/F**	***/F**	***/F**	***/F**
	Westbound Approach	--	--	***60.7/F**	***/F**	***55.0/F**	***/F**
	Mitigated (With Traffic Signal)	7.0/A	7.4/A	7.6/A	8.4/A	7.5/A	8.2/A
5.	Petaluma Blvd N/E Washington St	34.3/C	38.4/D	35.5/D	38.9/D	35.4/D	39.1/D
6.	E Washington St/N Water St	0.0/A	0.2/A	0.0/A	0.2/A	0.1/A	0.3/A
	Southbound Approach	*11.1/B*	*10.2/B*	11.1/B	10.2/B	*11.2/B*	*10.2/B*
7.	E Washington St/Lakeville St	41.7/D	**71.4/E**	41.6/D	**74.1/E**	41.6/D	**74.2/E**
8.	E Washington St/US 101 SB Ramps	33.2/C	43.8/D	33.6/C	44.8/D	33.6/C	44.8/D
9.	E Washington St/US 101 NB Ramps	8.4/A	14.0/B	8.4/A	14.1/B	8.4/A	14.1/B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results are displayed as Delay/LOS; ORH = Old Redwood Highway; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* **Bold** text = deficient operation; ** indicates delay >120 seconds; Shaded cells indicate conditions with recommended mitigation

It should be noted that with the addition of project-related traffic volumes, average delay at the East Washington Street/Lakeville Street intersection decreases slightly during the a.m. peak hour. While this is counter-intuitive, this condition occurs when a project adds trips to movements that are currently underutilized or have delays that are below the intersection average, resulting in a better balance between approaches and lower overall average delay.

Finding – The study intersections are expected to continue operating acceptably upon the addition of Alternative 1 and Alternative 2 project-generated traffic to Existing plus Pipeline volumes, except at Lakeville Street/East Washington Street where LOS E operation is projected to continue during the p.m. peak hour. Because this intersection is expected to continue operating at the same service level of LOS E, the project impact is considered less-than-significant under the standards applied. Additionally, Petaluma Boulevard North/Oak Street is expected to operate deficiently. Operation at the study intersections is similar regardless of the availability of a connection to East Washington Street via North Water Street, except that deficient operation further deteriorates at Petaluma Boulevard North/Oak Street without the connection. Operation would improve at Petaluma Boulevard North/Oak Street to acceptable LOS A during both peak hours with the installation of a traffic signal.

Recommendation – The applicant should install a traffic signal at Petaluma Boulevard North/Oak Street.

Cumulative plus Project Conditions

Intersection Operation

Upon the addition of project-generated traffic for Alternatives 1, 2, and 3 to the anticipated cumulative volumes, and assuming the same signal timing as applied for the Cumulative Conditions analysis, all but two of the study intersections are expected to operate acceptably overall. The intersections that are projected to operate unacceptably under the Cumulative plus each Project Alternative conditions are the same intersections that are projected to operate unacceptably under Cumulative conditions without the project. These results are summarized in Table 13.

Table 13 – Cumulative and Cumulative plus Project Alternatives 1, 2, and 3 Peak Hour Intersection LOS

	Study Intersection ***Approach***	**Cumulative**		**Cumulative plus Project Alt 1**		**Cumulative plus Project Alt 2**		**Cumulative plus Project Alt 3**	
		AM Peak	**PM Peak**	**AM Peak**	**PM Peak**	**AM Peak**	**PM Peak**	**AM Peak**	**PM Peak**
1.	ORH/US 101 SB Ramps	13.1/B	11.7/B	13.1/B	11.8/B	13.1/B	11.8/B	13.1/A	11.8/A
2.	ORH/US 101 NB Ramps	11.8/B	11.1/B	11.8/B	11.1/B	11.8/B	11.1/B	11.8/B	11.1/B
3.	Petaluma Blvd N/Lakeville St	13.4/B	19.1/B	13.4/B	19.2/B	13.4/B	19.2/B	13.5/B	19.3/B
4.	Petaluma Blvd N/Oak St	26.1/D	****/F**	**35.2/E**	****/F**	34.3/D	****/F**	32.5/D	****/F**
	Eastbound Approach	*****/F***	*****/F***	*****/F***	*****/F***	*****/F***	*****/F***	*****/F***	*****/F***
	Westbound Approach	***56.6/F***	*****/F***	*****/F***	*****/F***	***119.7/F***	*****/F***	***94.9/F***	*****/F***
	Mitigated (With Traffic Signal)	7.6/A	8.1/A	8.0/A	8.0/A	8.0/A	8.0/A	7.9/A	8.0/A
5.	Petaluma Blvd N/E Washington St	50.2/D	52.9/D	52.8/D	54.7/D	52.0/D	54.7/D	51.6/D	54.0/D
6.	E Washington St/N Water St	0.2/A	0.2/A	0.2/A	0.2/A	0.3/A	0.2/A	0.3/A	0.2/A
	Southbound Approach	*14.4/B*	*9.3/A*	*14.5/B*	*9.3/A*	*13.6/B*	*9.3/A*	*13.6/B*	*9.3/A*
7.	E Washington St/Lakeville St	**61.7/E**	**61.1/E**	**61.4/E**	**64.4/E**	**61.4/E**	**64.4/E**	**62.5/E**	**65.7/E**
8.	E Washington St/US 101 SB Ramps	18.8/B	26.0/C	18.8/B	26.3/C	18.8/B	26.3/C	18.8/B	26.3/C
9.	E Washington St/US 101 NB Ramps	8.5/A	13.0/B	8.4/A	13.0/B	8.4/A	13.0/B	8.4/A	13.0/B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results are displayed as Delay/LOS; ORH = Old Redwood Highway; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* **Bold** text = deficient operation; ** indicates delay >120 seconds; Shaded cells indicate conditions with recommended mitigation

Finding – With project traffic added under all three alternatives evaluated, Lakeville Street/East Washington Street would continue to operate at LOS E (at the same level of service as without the project), which is considered a less-than-significant impact under the applied standard. Operation at Petaluma Boulevard North/Oak Street would continue to operate at the same levels of service as without the project, except for Alternative 1 during the a.m. peak hour, when it is expected to operate at LOS E. The addition of other access points on Water Street would result in marginal improvements to operation at Petaluma Boulevard North/Oak Street. The addition of project traffic would cause the eastbound and westbound approaches at Petaluma Boulevard North/Oak Street, which are expected to operate at LOS F under Cumulative conditions during both peak hours, to further degrade. Operation would improve at Petaluma Boulevard North/Oak Street to acceptable LOS A during both peak hours with the installation of a traffic signal.

Recommendation – As identified in the Existing plus Project analysis scenario, the applicant should install a traffic signal at Petaluma Boulevard North/Oak Street. It should be noted that consideration was given to other improvements at the intersection, including restricting the eastbound and westbound approaches to right turns only. While the turning movement restrictions would result in acceptable LOS both overall and for the side-street approaches at Petaluma Boulevard North/Oak Street, the resulting effects on circulation within the adjacent roadway network could lead to worsened operational conditions at nearby intersections.

Queuing Analysis

A queuing analysis was performed for the Petaluma Boulevard North approaches to the intersections at Oak Street and East Washington Street to determine whether queuing conditions along the corridor would be affected by signalization of the Petaluma Boulevard/Oak Street intersection. The projected vehicle queues were determined using the applied timing schemes in SIMTRAFFIC, which is a traffic simulation extension of SYNCHRO that generates random "seeding" of vehicles on the street network and then simulates how vehicles will flow through the system using the actual volumes, phasing, and timing developed in SYNCHRO. Because each SIMTRAFFIC run is unique, a series of ten separate "runs" was used to develop queuing estimates. The 95th percentile queues projected for each lane in the ten SIMTRAFFIC runs were averaged and are reported as the maximum queue.

Vehicle queues on Petaluma Boulevard North at Oak Street are projected to remain within the available storage. At the Petaluma Boulevard North/East Washington Street intersection, queue lengths are expected to exceed available storage on the following movements during the specified scenario and study period:

- **Northbound left-turn movement under all scenarios during both peak hours.** With the Project Alternatives and signalization, there is either a slight decrease or slight increase in queue length—the change is less-than-significant and can be attributed to the stochastic nature of the SIMTRAFFIC program; the project itself is not expected to result in a measurable change to queue lengths on this movement.
- **Northbound through movement under the Cumulative plus Project Alternative 1 and plus Project Alternative 3.** During the a.m. peak hour, maximum queue lengths are projected to increase by approximately 30 to 50 feet (or approximately one to two vehicle lengths), and during the p.m. peak hour, maximum queue lengths are projected to increase by approximately 30 feet (or approximately one vehicle length), which indicates that the project would impact Petaluma Boulevard North by increase queue lengths.
- **Northbound right-turn movement under all scenarios during both peak hours.** With the Project Alternatives and signalization, there is either a slight decrease or slight increase in queue length as compared to the Cumulative scenario. The project is therefore projected to result in immeasurable changes to queue lengths on this movement.
- **Southbound left-turn movement under all scenarios during both peak hours.** With the Project Alternatives and signalization, there is either a slight decrease or slight increase in queue length as compared to the Cumulative scenario. The project is therefore projected to result in immeasurable changes to queue lengths on this movement.
- **Southbound through movement under the Cumulative plus Project Alternative 1 scenario.** During the a.m. peak hour, queue lengths would increase by approximately 100 feet (or approximately five vehicle lengths) as compared to the Cumulative condition, which indicates that the project would impact Petaluma Boulevard North by increase queue lengths.
- **Southbound right-turn movement under all scenarios during both peak hours.** With the Project Alternatives, there is either a slight decrease or slight increase in queue length as compared to the Cumulative scenario. The project is therefore projected to result in immeasurable changes to queue lengths on this movement.

A comparison of the queues for the Cumulative scenario (no project and without signalization at Petaluma Boulevard North/Oak Street) and Cumulative plus Project Alternatives (with signalization of the Petaluma Boulevard North/Oak Street intersection) during the a.m. and p.m. peak hour is summarized in Table 14. Copies of the SIMTRAFFIC projections are contained in Appendix C.

Table 14 – Peak Hour Queues along Petaluma Boulevard North – Cumulative Scenarios						
Study Intersection	**Northbound**			**Southbound**		
Scenario	**L**	**T**	**TR/R**	**L**	**T**	**TR/R**
Petaluma Blvd N/Oak St						
Available Storage	70	--	1,226	70	--	633
Maximum Queue						
Cumulative	28/19	--	--	25/26	--	10/40
Cumulative plus Project Alt 1	27/20	--	194/289	63/64	--	424/330
Cumulative plus Project Alt 2	45/25	--	189/194	23/47	--	343/349
Cumulative plus Project Alt 3	36/13	--	188/283	38/49	--	393/307
Petaluma Blvd N/E Washington St						
Available Storage	80	590	100	160	1,226	120
Maximum Queue						
Cumulative	**166/164**	**631/701**	**204/206**	**206/221**	1,196/1,089	**198/153**
Cumulative plus Project Alt 1	**167/175**	**679/735**	**204/204**	**198/219**	**1,322**/1,102	**187/162**
Cumulative plus Project Alt 2	**167/132**	543/**595**	**197/195**	**210/207**	1,153/1,053	**198/192**
Cumulative plus Project Alt 3	**154/164**	**653/743**	**193/206**	**215/217**	1,187/1,088	**195/166**

Notes: LT = Left-turn/through movement; TR = Through/right-turn movement; R = Right-turn movement; Queues shown as AM/PM; Maximum (95th Percentile) Queue represents the maximum queues that develop within SIMTRAFFIC (values represent the average of 5 SIMTRAFFIC runs); all distances are measured in feet; **Bold** text = deficient operation

The potential for vehicle queues to exceed available storage along the Petaluma Boulevard North corridor could be reduced by implementing coordinated signal timing in the future. One potential means of enabling the project to offset its impacts to cumulative queuing would be for the project to install signal interconnect conduit between the new Oak Street signal and the adjacent signals at Lakeville Street and East Washington Street. This installation is considered best practice by providing the physical improvements (the interconnect conduit) needed that would allow signal coordination to be implemented along the corridor in the future. Traffic signal coordination allows traffic signals at adjacent intersections to work together, resulting in vehicles passing through multiple intersections with the fewest number of stops needed, and thereby improving traffic flow. Along Petaluma Boulevard North, traffic signal coordination would improve flow and reduce the potential for queues to exceed available storage.

Finding – With project traffic added under all alternatives evaluated, queue lengths during peak hours may increase by 30 to 100 feet for the northbound and southbound approaches of Petaluma Boulevard North/East Washington Street, which is equivalent to approximately one to five passenger vehicles.

Recommendation – The project should be responsible for installing traffic signal interconnect conduit between the new traffic signal at the Petaluma Boulevard North/Oak Street and the adjacent signalized intersections at Lakeville Street and East Washington Street.

Signalization of Petaluma Boulevard North/Oak Street

The need for a traffic signal at Petaluma Boulevard North/Oak Street was evaluated for the following scenarios for both peak hours:

- Existing Conditions
- Existing plus Project Alternative 2

- Existing plus Pipeline Conditions
- Existing plus Pipeline plus Project Alternative 2
- Cumulative Conditions
- Cumulative plus Project Alternative 3

Alternative 2 adds fewer project trips to the intersection of Petaluma Boulevard North/Oak Street than Alternative 1 for Existing and Existing plus Pipeline scenarios and Alternative 3 adds the fewest project trips to Petaluma Boulevard North/Oak Street for Cumulative scenarios, providing the most conservative analysis.

Traffic Signal Warrants

A signal warrant analysis was performed to determine need for a traffic signal at Petaluma Boulevard North/Oak Street. Chapter 4C of the *California Manual on Uniform Traffic Control Devices* (CA-MUTCD) provides guidance on when a traffic signal should be considered. There are nine different warrants, or criteria, presented:

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour Volume
- Warrant 4, Pedestrian Volume
- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network
- Warrant 9, Intersection Near a Grade Crossing

Warrant 1 bases the need for a traffic control signal if an engineering study finds that one of the following conditions exist for each of any eight hours of an average day:

- The vehicles per hour given in both of the 100 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or

- The vehicles per hour given in both of the 100 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

In applying each condition, the major-street and minor-street volumes shall be for the same eight hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these eight hours.

Warrant 1 was not analyzed because 24-hour traffic volume data for Petaluma Boulevard or Oak Street are not available.

Warrant 2 is met when an engineering study finds that, for each of any four hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these four hours.

As stated for Warrant 1, data was not available to complete an analysis of Warrant 2.

Warrant 3, which is often the first warrant to be met, has a notice that this signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time. Under the Peak Hour Warrant, the

need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same one hour (any four consecutive 15-minute periods) of an average day:

   1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: four vehicle-hours for a one-lane approach; or five vehicle-hours for a two-lane approach, and
   2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and
   3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for one hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.

The signal is warranted for all p.m. scenarios, as shown below in Table 15. Operation would improve at Petaluma Boulevard North/Oak Street to acceptable LOS A during both peak hours with the installation of a traffic signal.

Table 15 – Signal Warrant Analysis for Petaluma Blvd N/Oak St for Peak-Hour Volumes and Delay

Scenario	AM Peak	PM Peak
1. Existing	Not Met	**Met**
2. Existing plus Project (Alternative 1)	Not Met	**Met**
3. Existing plus Pipeline	Not Met	**Met**
4. Existing plus Pipeline plus Project (Alternative 2)	**Met**	**Met**
5. Cumulative	**Met**	**Met**
6. Cumulative plus Project (Alternative 3)	**Met**	**Met**

The volumes for all p.m. peak hour scenarios are sufficient to meet Warrant 3 both without and with the addition of project-generated traffic. The calculations are provided in Appendix D.

Warrant 4 addresses the need for a traffic control signal at an intersection or midblock crossing if an engineering study finds that both of the following criteria are met:

A. The pedestrian volume crossing the major street at an intersection or midblock location during an average day is 100 or more for each of any four hours or 190 or more during any one hour; and

B. There are fewer than 60 gaps per hour in the traffic stream of adequate length to allow pedestrians to cross during the same period when the pedestrian volume criterion is satisfied. Where there is a divided street having a median of sufficient width for pedestrians to wait, the requirement applies separately to each direction of vehicular traffic.

The CA-MUTCD goes on to say that Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.

The traffic data collected for the intersection of Petaluma Boulevard North/Oak Street did not include pedestrian counts. Because of the close proximity of the project to downtown Petaluma, residents and project site patrons may choose get to and from downtown on foot, and could potentially add to the number of pedestrians crossing currently crossing Petaluma Boulevard North.

Warrant 5 is the School Crossing warrant. The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the children are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 students during the highest crossing hour.

Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Since the proposed project is not within close vicinity to a school and would not experience significant pedestrian volumes from school children, this Warrant would not be met.

Warrant 6 is used when consideration is being given to adding a signal within a coordinated system. The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.

B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

Generally, this warrant is not applied where the resultant spacing the traffic control signals would be less than 1,000 feet. The closest signalized intersection is 650 feet north of Petaluma Boulevard North/Oak Street at Petaluma Boulevard/Lakeville Street; therefore, this warrant is not met.

Warrant 7 addresses the collision history of a location. The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

C. For each of any eight hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes

shall be for the same eight hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the eight hours.

Since Petaluma Boulevard North/Oak Street has only experienced two collisions within the last five years, this warrant is not met.

Warrant 8 looks at the circulation system. Under this warrant, the need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has five-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any five hours of a non-normal business day (Saturday or Sunday).

A major route as used in this signal warrant shall have one or more of the following characteristics:

A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow; or

B. It includes rural or suburban highways outside, entering, or traversing a City; or

C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.

Warrant 8 would not be met since, while Petaluma Boulevard North is a part of the principal roadway network, Oak Street is a collector street.

Warrant 9 is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a railroad grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal. This signal warrant should be applied only after adequate consideration has been given to other alternatives or after a trial of an alternative has failed to alleviate the safety concerns associated with the grade crossing. Among the alternatives that should be considered or tried are providing additional pavement that would enable vehicles to clear the track or that would provide space for an evasive maneuver, or reassigning the stop controls at the intersection to make the approach across the track a non-stopping approach.

The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:

C. A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach; and

D. During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 1A.13.

Since the intersection is not approaching a grade crossing and does meet Warrant 3, Warrant 9 is not met.

Finding – The "Peak Hour" signal warrant is projected to be met at Petaluma Boulevard North/Oak Street under Existing plus Pipeline plus Project conditions, as well as under Cumulative conditions both with and without the North River Apartments project.

Effect of the Signalization of Petaluma Boulevard North/Oak Street

If the intersection control at Petaluma Boulevard North/Oak Street were to be converted from side-street stop-controlled to a traffic signal, the travel patterns of residents, employees, and patrons of the project site, surrounding neighborhoods, and cross-town traffic may change, including the potential for more trips on the local streets parallel to Petaluma Boulevard North in the Oak Hill neighborhood to the west.

As citywide and regional growth continues to occur in the future, traffic volumes on East Washington Street and Petaluma Boulevard North will increase. Conversely, the number of vehicle trips generated from within the Oak Hill neighborhood would be expected to remain largely unchanged since the area is built out. As a result, these streets are likely to continue to have available capacity.

The installation of a traffic signal at Petaluma Boulevard North/Oak Street is projected to be warranted under Existing plus Pipeline plus Project conditions, and would also be warranted under Cumulative conditions, both with and without development of the North River Apartments project. A signal would facilitate both local and non-local traffic to pass through the Oak Hill neighborhood, particularly those traveling in a west-to-north direction, by providing a convenient and relatively low-delay location for drivers to rejoin traffic on Petaluma Boulevard. In other words, drivers travelling eastbound toward Petaluma Boulevard North from the neighborhood will likely find it easier to make a left-turn maneuver at a signalized intersection, rather than having to wait for an acceptable gap in traffic that would allow them to turn left onto Petaluma Boulevard North from other east-west streets, where through traffic travelling along Petaluma Boulevard North is uncontrolled. While a modest number of patrons and residents of the North River Apartments project may travel through the neighborhood, any potential traffic increases on parallel neighborhood streets are expected to be primarily attributable to induced trips created by non-local traffic and traffic originating from the Oak Hill neighborhood itself, diverting from Petaluma Boulevard North and East Washington Street via the new signalized intersection at Oak Street.

Volume data for Kentucky Street, Keller Street, Liberty Street, and Keokuk Street between Oak Street and Prospect Street was collected September 7 to 8, 2016. Streets are considered "local roads" when the average daily traffic (ADT) is 2,000 vehicles. Kentucky Street, Keller Street, and Liberty Street all carry less than 1,000 vehicles per day. Keokuk Street carries more vehicles per day with an ADT of 1,158; this is the only street that connects to Magnolia Avenue to the north. Both Keokuk Street and Oak Street are identified as collector streets, per the General Plan. It should be noted that the project in and of itself generates fewer than 100 peak hour trips, of which a nominal number of vehicles could potentially travel via the neighborhood streets. Even if the total number of trips were applied to the neighborhood streets, the project would not result in exceeding the available capacity. The neighborhood street data is summarized in Table 16, and Average Daily Traffic and intersection traffic control in the Oak Hill neighborhood are shown in Figure 9.

Table 16 – Neighborhood Street Data

Route	ADT
Kentucky St	972
Keller St	732
Liberty St	646
Keokuk St	1,158

200pet.ai 4/17

Traffic Impact Study for the North River Apartments

Figure 9 – Existing Intersection Traffic Control Types and Road Segment Daily Traffic Volumes

Finding – The installation of a traffic signal at Petaluma Boulevard North/Oak Street may encourage non-local drivers traveling between East Washington Street and Petaluma Boulevard North to use local streets in the Oak Hill neighborhood rather than remain on arterial streets.

Finding – Signalization of the Petaluma Boulevard North/Oak Street intersection is projected to be necessary under cumulative conditions regardless of whether North River Apartments is built, though completion of the project would accelerate the need for signal installation.

Finding – The increase in traffic on Kentucky Street, Keller Street, Liberty Street, and Keokuk Street that is attributable to the proposed project is expected to be imperceptible to residents living on those streets. However, other motorists traveling between East Washington Street and Petaluma Boulevard North may benefit from the signalization of the intersection and contribute to an increase in volumes on the neighborhood streets.

Alternative Modes

Pedestrian Facilities

Given the proximity of the downtown commercial area near the site as well as the planned SMART station to the east of the site, it is reasonable to assume that some project residents will regularly walk, bicycle, and/or utilize transit.

Project Site – Sidewalks exist along the project frontage on Petaluma Boulevard North. The site plan indicates that sidewalks will be provided along both sides of the eastern extension of Oak Street between Petaluma Boulevard North and North Water Street and along both sides of North Water Street from the south side of the project to Oak Street. Crosswalks and curb ramps would be installed on the east leg of Petaluma Boulevard North/Oak Street, the west and north legs of North Water Street/Oak Street, and at a mid-block crossing between the project buildings, approximately 150 feet south of North Water Street/Oak Street. Additionally, a 12-foot wide concrete path would be installed on the segment of the Petaluma River Trail that runs along the project frontage.

The *Central Petaluma Specific Plan* (CPSP) indicates that a roadway connection is planned between Petaluma Boulevard North/Oak Street and the existing northern terminus of North Water Street to Copeland Street on the east side of the Petaluma River. Because existing vehicle facilities are expected to provide sufficient capacity in the area, and due to the secondary impacts that may be associated with providing this vehicular connection across the Petaluma River, a bridge that serves vehicles is not recommended. However, there is an existing pedestrian/bicycle bridge that spans the Petaluma River near the southeast edge of the site. Connecting the site to this bridge would result in improved pedestrian circulation within the plan area, with access to the SMART station area, and align with policies contained within the CPSP and General Plan.

The site plan illustrates a shared bicycle and pedestrian path to serve as a connection from North Water Street to the existing pedestrian/bicycle bridge along the north side of Building A.

Finding – Pedestrian facilities serving the project site are expected to be adequate.

Bicycle Facilities

Class II bike lanes are planned along Oak Street between Petaluma Boulevard North and the pedestrian/bicycle bridge and along North Water Street between Oak Street and Lakeville Street. In order to provide bike lanes along these segments, parking along both sides of the street or one travel lane would need to be removed. One-way streets would restrict circulation in this area, and are not recommended. Parallel Class I bike paths exist and/or are planned along the Petaluma River and should serve as an adequate separate facility for bicyclists. It is understood that travel lanes along North Water Street and Oak Street are proposed to be 10 feet wide. These conditions help to calm traffic, making these streets suitable for Class II bike route designation.

As noted above, the site plan indicated there would be a shared bicycle and pedestrian connection from North Water Street to the existing pedestrian/bicycle bridge along the north side of Building A.

Finding – Existing bicycle facilities serving the project site are expected to be adequate with the implementation of recommendations listed below.

Recommendations – The applicant should install "sharrows" along the project's frontage on Oak Street and North Water Street, with accompanying bike route and wayfinding signage. All such markings and signage should be consistent with the scheme established for the area by the City.

Bicycle Storage

The Petaluma Zoning Code (Standard 11.090) requires that public bicycle parking be provided at a rate of 25 percent of automobile spaces for the retail/commercial components of the project and private bicycle parking be provided at a rate of 10 percent of automobile spaces for the residential component of the project. The site requires 15 retail/commercial automobile parking spaces and 185 residential automobile parking spaces, therefore a minimum of 25 bicycle parking spaces should be provided. The site plan indicates that 93 bicycle parking spaces will be provided on site.

Finding – Bicycle storage serving the project site is indicated on the site plan and is adequate.

Transit

Existing transit routes are expected to adequately accommodate project-generated transit trips with the recommended improvements to pedestrian connections under the Pedestrian Facilities section. Existing bus stops are within acceptable walking distance of the site, and the SMART station is also considered to be within convenient walking and bicycling distance.

Finding – Transit facilities serving the project site are expected to be adequate with improvements to pedestrian connections.

Access and Circulation

Site Access

The project would be accessible via two driveways on North Water Street approximately 175 feet south of North Water Street/Oak Street, with one driveway providing access to the western parcel and one directly across providing access to the eastern parcel.

Sight Distance

At unsignalized intersections, a substantially clear line of sight should be maintained between the driver of a vehicle waiting at the crossroad and the driver of an approaching vehicle. Adequate time must be provided for the waiting vehicle to either cross, turn left, or turn right, without requiring the through traffic to radically alter their speed. Sight distance should be measured from a 3.5-foot height at the location of the driver on the minor road to a 4.25-foot object height in the center of the approaching lane of the major road. Setback for the driver on the crossroad shall be a minimum of 15 feet, measured from the edge of the traveled way.

Sight distance along North Water Street at the project driveways was evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. The recommended sight distances for minor street approaches that are either a private road or a driveway are based on stopping sight distance. Both use the approach travel speeds as the basis for determining the recommended sight distance. Additionally, the stopping sight distance needed for a following driver to stop if there is a vehicle waiting to turn into a side street or driveway is evaluated based on stopping sight distance criterion and the approach speed on the major street.

Sight distance at the proposed project driveways on North Water Street were measured on the site plan. Based on the stopping sight distance criterion for private street intersections and a posted speed of 25 miles per hour (mph), the minimum stopping sight distance required is 150 feet. Lines of sight exceed the minimum required sight distances at the North Water Street project driveways.

Finding – Sight distance is expected to be adequate at the project driveways on North Water Street.

Conclusions and Recommendations

Conclusions

- Six out of nine study intersections had collision rates that are higher than the statewide average for similar facilities. The City has recently completed improvements at the East Washington Street/US 101 interchange and also Lakeville Highway/East Washington Street which are expected to reduce the incidence of collisions. Newly-installed improvements that restrict turning movements are expected to reduce collisions at East Washington Street/North Water Street.

- Currently, all nine study intersections operate acceptably during the a.m. and p.m. peak hours.

- Under Existing plus Pipeline conditions, the study intersections are expected to continue to operate acceptably during both peak hours, except Lakeville Street/East Washington Street during the p.m. peak hour, which is expected to operate unacceptably at LOS E.

- Under Cumulative conditions, the study intersections are projected to operate acceptably overall during both peak hours, except Lakeville Street/East Washington Street would operate at LOS E overall during both peak hours. The eastbound and westbound Oak Street approaches at Petaluma Boulevard North are expected to operate unacceptably at LOS F during both peak hours, though the intersection would operate acceptably overall at LOS D during the a.m. peak hour and unacceptably at LOS F during the p.m. peak hour.

- Lakeville Street/East Washington Street was identified in the City's General Plan as operating acceptably under near-term and cumulative conditions. However, recently completed safety-related changes to the signal phasing have reduced efficiency, resulting in projected LOS E operation under both scenarios.

- The proposed project would be expected to generate a total of 1,375 new trips per day, with 61 new trips during the a.m. peak hour and 83 trips during the p.m. peak hour.

- Under Existing plus Project Alternative 1 or 2 conditions, the study intersections are expected to continue operating acceptably, except Petaluma Boulevard North/Oak Street, which is expected to operate deficiently at LOS E during the p.m. peak hour, with deficient LOS E or F operation on the eastbound and westbound Oak Street approaches. Operation at the study intersections is consistent regardless of availability of a connection to East Washington Street via North Water Street, except delay worsens at Petaluma Boulevard North/Oak Street.

- The study intersections are expected to continue operating acceptably under Existing plus Pipeline plus Project Alternatives 1 or 2 conditions, except at Lakeville Street/East Washington Street where LOS E operation is projected to continue, which is considered a less-than-significant impact under the standards applied, and Petaluma Boulevard North/Oak Street where service levels degrade to deficient LOS F during the p.m. peak hour. The eastbound and westbound Oak Street approaches would operate at unacceptable LOS F. Operation at the study intersections is consistent regardless of availability of a connection to East Washington Street via North Water Street, except delay worsens at Petaluma Boulevard North/Oak Street.

- Under Cumulative plus Project Alternatives 1, 2, or 3 conditions, the intersections are expected to operate acceptably, except Lakeville Street/East Washington Street and Petaluma Boulevard North/Oak Street. Lakeville Street/East Washington Street is expected to operate at the same levels of service as without the project (for any of the alternatives). The eastbound and westbound approaches of Petaluma Boulevard North/Oak Street are expected to further degrade with increased delay upon the addition of project-added traffic during the p.m. peak hour.

- Queue lengths may increase upwards of 30 to 100 feet for the northbound and southbound approaches of Petaluma Boulevard North/East Washington Street under Cumulative plus Project conditions (with the traffic signal at Petaluma Boulevard North/Oak Street) as compared to Cumulative conditions (without the project or traffic signal), which is equivalent to approximately one to five passenger vehicles.

- Operation would improve at Petaluma Boulevard North/Oak Street to acceptable LOS A during both peak hours with the installation of a traffic signal.

- The Petaluma Boulevard North/Oak Street intersection meets the "Peak Hour Warrant" (Warrant 3) criteria for installation of a traffic signal under Existing plus Pipeline plus Project conditions, as well as for cumulative conditions both with and without the North River Apartments project.

- The installation of a traffic signal at Petaluma Boulevard North/Oak Street may encourage some drivers traveling between East Washington Street and Petaluma Boulevard North to use local streets in the Oak Hill neighborhood rather than remain on arterial streets.

- Signalization of the Petaluma Boulevard North/Oak Street intersection is projected to be necessary under cumulative conditions regardless of whether North River Apartments is built, though completion of the project would accelerate the need for signal installation.

- The increase in traffic on Kentucky Street, Keller Street, Liberty Street, and Keokuk Street that is attributable to the proposed project is expected to be imperceptible to residents living on those streets. However, other motorists traveling between East Washington Street and Petaluma Boulevard North may benefit from the signalization of the intersection and contribute to an increase in volumes on the neighborhood streets.

- Upon completion of the sidewalk and pathway connections to be constructed by the project, pedestrian circulation is expected to be adequate.

- Bicycle facilities as proposed may not adequately accommodate bike circulation, though with implementation of the recommended improvements, bicycle facilities are expected to be adequate and satisfy the City's policy goals.

- Transit facilities are expected to be adequate with the completion of the pedestrian facility improvements to be constructed by the project.

- Sight distance is adequate at the project driveways on North Water Street.

Recommendations

- The applicant should install a traffic signal at the intersection of Petaluma Boulevard North/Oak Street. As part of the signal construction, traffic signal interconnect should be installed between the new signal and adjacent signals at Petaluma Boulevard North/Lakeville Street and Petaluma Boulevard North/East Washington Street.

- The applicant should install "sharrows" along the project's frontage on North Water Street and Oak Street, with accompanying bike route and wayfinding signage.

Study Participants and References

Study Participants

Principal in Charge	Dalene J. Whitlock, PE, PTOE
Associate Engineer	Smadar Boardman, PE
Assistant Engineer	Lauren Davini, EIT
Assistant Planner	Shannon Baker
Graphics/Editing/Formatting	Angela McCoy

References

2012 Collision Data on California State Highways, California Department of Transportation, 2012
California Department of Transportation Traffic Data Branch, http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/
California Manual on Uniform Traffic Control Devices for Streets and Highways, California Department of Transportation, 2012
Central Petaluma Specific Plan, City of Petaluma, 2003
City of Petaluma: Bicycle and Pedestrian Plan: an Appendix to the General Plan 2025, City of Petaluma, 2008
City of Petaluma: General Plan 2025, City of Petaluma, 2008
East Washington Place EIR, Design, Community & Environment, 2009
Golden Gate Transit, http://goldengatetransit.org/schedules/current/
Highway Capacity Manual, Transportation Research Board, 2000
Highway Design Manual, 6th Edition, California Department of Transportation, 2012
Petaluma Municipal Code, Code Publishing Company, 2016
Petaluma Transit, http://www.cityofpetaluma.net/pubworks/transit-sub.html
Riverfront Mixed-Use Project EIR, Strelow Consulting, 2014
Sonoma County Transit, http://sctransit.com/
Sonoma-Marin Area Rail Transit, http://www.sonomamarintrain.org/
Statewide Integrated Traffic Records System (SWITRS), California Highway Patrol, 2008-2013
Trip Generation Manual, 9th Edition, Institute of Transportation Engineers, 2012

PET200

Appendix A

Collision Rate Calculations

Intersection Collision Rate Calculaions

North River Landing

Intersection # 1: Old Redwood Highway & US 101 SB Ramps

Date of Count: Thursday, August 27, 2015

Number of Collisions: 17
Number of Injuries: 3
Number of Fatalities: 0
ADT: 28500
Start Date: October 1, 2008
End Date: September 30, 2013
Number of Years: 5

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

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

$$\text{collision rate} = \frac{17 \times 1{,}000{,}000}{28{,}500 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.33 c/mve**	**0.0%**	**17.6%**
Statewide Average*	**0.27 c/mve**	**0.4%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2012 Collision Data on California State Highways, Caltrans

Intersection # 2: Old Redwood Highway & US 101 NB Ramps

Date of Count: Thursday, August 27, 2015

Number of Collisions: 14
Number of Injuries: 3
Number of Fatalities: 0
ADT: 31200
Start Date: October 1, 2008
End Date: September 30, 2013
Number of Years: 5

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

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

$$\text{collision rate} = \frac{14 \times 1{,}000{,}000}{31{,}200 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.25 c/mve**	**0.0%**	**21.4%**
Statewide Average*	**0.27 c/mve**	**0.4%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2012 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculaions

North River Landing

Intersection # 3: Petaluma Boulevard N & Lakeville St

Date of Count: Tuesday, October 28, 2014

Number of Collisions: 4
Number of Injuries: 2
Number of Fatalities: 0
ADT: 19800
Start Date: October 1, 2008
End Date: September 30, 2013
Number of Years: 5

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

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

$$\text{collision rate} = \frac{4 \times 1{,}000{,}000}{19{,}800 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.11 c/mve**	**0.0%**	**50.0%**
Statewide Average*	**0.27 c/mve**	**0.4%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2012 Collision Data on California State Highways, Caltrans

Intersection # 4: Petaluma Boulevard N & Oak Street

Date of Count: Wednesday, August 26, 2015

Number of Collisions: 2
Number of Injuries: 2
Number of Fatalities: 0
ADT: 16000
Start Date: October 1, 2008
End Date: September 30, 2013
Number of Years: 5

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

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

$$\text{collision rate} = \frac{2 \times 1{,}000{,}000}{16{,}000 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.07 c/mve**	**0.0%**	**100.0%**
Statewide Average*	**0.18 c/mve**	**0.7%**	**36.4%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2012 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculaions

North River Landing

Intersection # 5: Petaluma Boulevard N & E Washington St

Date of Count: Thursday, March 27, 2014

Number of Collisions: 41
Number of Injuries: 12
Number of Fatalities: 0
ADT: 29900
Start Date: October 1, 2008
End Date: September 30, 2013
Number of Years: 5

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

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

$$\text{collision rate} = \frac{41 \times 1{,}000{,}000}{29{,}900 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.75 c/mve**	**0.0%**	**29.3%**
Statewide Average*	**0.27 c/mve**	**0.4%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2012 Collision Data on California State Highways, Caltrans

Intersection # 6: E Washington St & N Water St

Date of Count: Wednesday, January 21, 2015

Number of Collisions: 12
Number of Injuries: 8
Number of Fatalities: 0
ADT: 17200
Start Date: October 1, 2008
End Date: September 30, 2013
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Stop & Yield Controls
Area: Urban

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

$$\text{collision rate} = \frac{12 \times 1{,}000{,}000}{17{,}200 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.38 c/mve**	**0.0%**	**66.7%**
Statewide Average*	**0.15 c/mve**	**1.0%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2012 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculaions

North River Landing

Intersection # 7: E Washington St & Lakeville St

Date of Count: Thursday, March 27, 2014

Number of Collisions: 47
Number of Injuries: 14
Number of Fatalities: 0
ADT: 26600
Start Date: October 1, 2008
End Date: September 30, 2013
Number of Years: 5

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

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

$$\text{collision rate} = \frac{47 \times 1{,}000{,}000}{26{,}600 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.97 c/mve**	**0.0%**	**29.8%**
Statewide Average*	**0.27 c/mve**	**0.4%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2012 Collision Data on California State Highways, Caltrans

Intersection # 8: E Washington St & US 101 SB Ramps

Date of Count: Tuesday, October 28, 2014

Number of Collisions: 31
Number of Injuries: 11
Number of Fatalities: 0
ADT: 40200
Start Date: October 1, 2008
End Date: September 30, 2013
Number of Years: 5

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

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

$$\text{collision rate} = \frac{31 \times 1{,}000{,}000}{40{,}200 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.42 c/mve**	**0.0%**	**35.5%**
Statewide Average*	**0.27 c/mve**	**0.4%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2012 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculaions

North River Landing

Intersection # 9: E Washington St & US 101 NB Ramps

Date of Count: Tuesday, October 28, 2014

Number of Collisions: 33
Number of Injuries: 6
Number of Fatalities: 0
ADT: 41200
Start Date: October 1, 2008
End Date: September 30, 2013
Number of Years: 5

Intersection Type: Tee
Control Type: Signals
Area: Urban

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

$$\text{collision rate} = \frac{33 \times 1{,}000{,}000}{41{,}200 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.44 c/mve**	**0.0%**	**18.2%**
Statewide Average*	**0.21 c/mve**	**0.3%**	**42.4%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2012 Collision Data on California State Highways, Caltrans

Appendix B

Intersection Level of Service Calculations

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

3/24/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	708	468	177	735	810
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	778	514	195	808	890
RTOR Reduction (vph)	0	0	0	0	0	247
Lane Group Flow (vph)	0	778	514	195	808	643
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		38.3	38.3	73.3	27.0	27.0
Effective Green, g (s)		38.3	38.3	73.3	27.0	27.0
Actuated g/C Ratio		0.52	0.52	1.00	0.37	0.37
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1779	1849	1524	1216	987
v/s Ratio Prot		c0.23	0.15			
v/s Ratio Perm				0.13	c0.24	0.24
v/c Ratio		0.44	0.28	0.13	0.66	0.65
Uniform Delay, d1		10.8	9.8	0.0	19.4	19.2
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.8	0.4	0.2	1.4	1.6
Delay (s)		11.6	10.2	0.2	20.7	20.8
Level of Service		B	B	A	C	C
Approach Delay (s)		11.6	7.4		20.8	
Approach LOS		B	A		C	

Intersection Summary				
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.53			
Actuated Cycle Length (s)	73.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	47.9%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

3/24/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1100	497	328	407	518
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1134	512	338	420	534
RTOR Reduction (vph)	0	0	0	0	0	444
Lane Group Flow (vph)	0	1134	512	338	420	90
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		66.0	66.0	89.1	15.1	15.1
Effective Green, g (s)		66.0	66.0	89.1	15.1	15.1
Actuated g/C Ratio		0.74	0.74	1.00	0.17	0.17
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2522	2621	1524	559	454
v/s Ratio Prot		c0.33	0.14			
v/s Ratio Perm				0.22	c0.13	0.03
v/c Ratio		0.45	0.20	0.22	0.75	0.20
Uniform Delay, d1		4.5	3.5	0.0	35.2	31.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.6	0.2	0.3	5.6	0.2
Delay (s)		5.1	3.7	0.3	40.9	32.0
Level of Service		A	A	A	D	C
Approach Delay (s)		5.1	2.3		35.9	
Approach LOS		A	A		D	

Intersection Summary				
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	89.1	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.7%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

3/24/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	980	343	0	916	113	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1043	365	0	974	120	415
RTOR Reduction (vph)	0	0	0	0	0	116
Lane Group Flow (vph)	1043	365	0	974	120	299
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	48.1	68.8		48.1	12.7	12.7
Effective Green, g (s)	48.1	68.8		48.1	12.7	12.7
Actuated g/C Ratio	0.70	1.00		0.70	0.18	0.18
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2381	1583		2381	609	495
v/s Ratio Prot	c0.31			0.29		
v/s Ratio Perm		0.23			0.04	c0.11
v/c Ratio	0.44	0.23		0.41	0.20	0.60
Uniform Delay, d1	4.5	0.0		4.4	23.7	25.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.3		0.5	0.2	2.1
Delay (s)	5.1	0.3		4.9	23.9	27.8
Level of Service	A	A		A	C	C
Approach Delay (s)	3.8			4.9	26.9	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	68.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	47.4%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

3/24/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	802	579	0	1393	83	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	835	603	0	1451	86	269
RTOR Reduction (vph)	0	0	0	0	0	242
Lane Group Flow (vph)	835	603	0	1451	86	27
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	58.4	73.8		58.4	7.4	7.4
Effective Green, g (s)	58.4	73.8		58.4	7.4	7.4
Actuated g/C Ratio	0.79	1.00		0.79	0.10	0.10
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2695	1583		2695	331	268
v/s Ratio Prot	0.25			c0.43		
v/s Ratio Perm		c0.38			0.03	0.01
v/c Ratio	0.31	0.38		0.54	0.26	0.10
Uniform Delay, d1	2.1	0.0		2.8	30.7	30.2
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	0.7		0.8	0.4	0.2
Delay (s)	2.4	0.7		3.6	31.1	30.3
Level of Service	A	A		A	C	C
Approach Delay (s)	1.7			3.6	30.5	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.54			
Actuated Cycle Length (s)	73.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.5%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	4	0	0	35	0	146	0	483	56	153	703	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98			1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		1.00			0.89			0.98		1.00	1.00	
Flt Protected		0.95			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1770			1605			3413		1770	3470	
Flt Permitted		0.46			0.94			1.00		0.95	1.00	
Satd. Flow (perm)		860			1523			3413		1770	3470	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	5	0	0	40	0	166	0	549	64	174	799	1
RTOR Reduction (vph)	0	0	0	0	138	0	0	9	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	68	0	0	604	0	174	800	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		10.6			10.6			30.6		9.7	44.3	
Effective Green, g (s)		10.6			10.6			31.1		9.7	44.8	
Actuated g/C Ratio		0.17			0.17			0.49		0.15	0.71	
Clearance Time (s)		4.0			4.0			4.5		4.0	4.5	
Vehicle Extension (s)		4.0			4.0			4.0		1.0	4.0	
Lane Grp Cap (vph)		143			254			1674		270	2451	
v/s Ratio Prot								c0.18		c0.10	0.23	
v/s Ratio Perm		0.01			c0.04							
v/c Ratio		0.03			0.27			0.36		0.64	0.33	
Uniform Delay, d1		22.1			23.0			10.0		25.2	3.5	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.8			0.6		3.9	0.1	
Delay (s)		22.3			23.8			10.6		29.1	3.7	
Level of Service		C			C			B		C	A	
Approach Delay (s)		22.3			23.8			10.6			8.2	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.39			
Actuated Cycle Length (s)	63.4	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	43.8%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	3	1	67	0	253	2	771	40	142	647	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.89		1.00	0.99		1.00	1.00	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1782			1612		1770	3444		1770	3470	
Flt Permitted		0.93			0.93		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1685			1516		1770	3444		1770	3470	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	2	3	1	69	0	261	2	795	41	146	667	1
RTOR Reduction (vph)	0	1	0	0	154	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	176	0	2	832	0	146	668	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		11.3			11.3		0.7	22.9		6.9	29.1	
Effective Green, g (s)		11.3			11.3		0.7	23.4		6.9	29.6	
Actuated g/C Ratio		0.21			0.21		0.01	0.44		0.13	0.55	
Clearance Time (s)		4.0			4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)		2.0			2.0		2.0	4.0		1.0	4.0	
Lane Grp Cap (vph)		355			319		23	1503		227	1916	
v/s Ratio Prot							0.00	c0.24		c0.08	0.19	
v/s Ratio Perm		0.00			c0.12							
v/c Ratio		0.01			0.55		0.09	0.55		0.64	0.35	
Uniform Delay, d1		16.7			18.9		26.1	11.2		22.2	6.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			1.2		0.6	0.5		4.6	0.2	
Delay (s)		16.7			20.1		26.7	11.8		26.8	6.8	
Level of Service		B			C		C	B		C	A	
Approach Delay (s)		16.7			20.1			11.8			10.4	
Approach LOS		B			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	53.6	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	62.8%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	83	0	18	0	0	0	8	497	0	0	743	95
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	92	0	20	0	0	0	9	552	0	0	826	106
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.93	0.93		0.93	0.93	0.93				0.93		
vC, conflicting volume	1448	1448	878	1468	1501	552	931			552		
vC1, stage 1 conf vol	878	878		570	570							
vC2, stage 2 conf vol	570	570		898	931							
vCu, unblocked vol	1444	1444	878	1466	1501	482	931			482		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	68	100	94	100	100	100	99			100		
cM capacity (veh/h)	292	309	347	267	290	544	735			1006		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	112	0	561	931
Volume Left	92	0	9	0
Volume Right	20	0	0	106
cSH	300	1700	735	1006
Volume to Capacity	0.37	0.00	0.01	0.00
Queue Length 95th (ft)	42	0	1	0
Control Delay (s)	24.0	0.0	0.3	0.0
Lane LOS	C	A	A	
Approach Delay (s)	24.0	0.0	0.3	0.0
Approach LOS	C	A		

Intersection Summary					
Average Delay	1.8				
Intersection Capacity Utilization	57.2%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	103	0	12	0	0	0	4	764	0	0	657	63
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	114	0	13	0	0	0	4	849	0	0	730	70
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.89	0.89		0.89	0.89	0.89				0.89		
vC, conflicting volume	1623	1623	765	1636	1658	849	800			849		
vC1, stage 1 conf vol	765	765		858	858							
vC2, stage 2 conf vol	858	858		778	800							
vCu, unblocked vol	1639	1639	765	1654	1678	766	800			766		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	56	100	97	100	100	100	99			100		
cM capacity (veh/h)	262	278	403	254	271	357	823			751		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	128	0	853	800
Volume Left	114	0	4	0
Volume Right	13	0	0	70
cSH	272	1700	823	751
Volume to Capacity	0.47	0.00	0.01	0.00
Queue Length 95th (ft)	59	0	0	0
Control Delay (s)	29.4	0.0	0.1	0.0
Lane LOS	D	A	A	
Approach Delay (s)	29.4	0.0	0.1	0.0
Approach LOS	D	A		

Intersection Summary					
Average Delay	2.2				
Intersection Capacity Utilization	56.5%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	215	618	84	90	570	39	34	262	128	53	334	291
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3404		1770	3436		1770	1644	1563	1770	1644	1564
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3404		1770	3436		1770	1644	1563	1770	1644	1564
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	239	687	93	100	633	43	38	291	142	59	371	323
RTOR Reduction (vph)	0	10	0	0	5	0	0	0	86	0	0	96
Lane Group Flow (vph)	239	770	0	100	671	0	38	291	56	59	371	227
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Parking (#/hr)								0			0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	13.7	27.7		8.3	22.3		3.7	23.2	31.5	4.0	23.5	37.2
Effective Green, g (s)	13.7	27.7		8.3	22.3		3.7	23.2	31.5	4.0	23.5	37.2
Actuated g/C Ratio	0.17	0.35		0.10	0.28		0.05	0.29	0.40	0.05	0.30	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	306	1190		185	967		82	481	700	89	487	813
v/s Ratio Prot	c0.14	c0.23		0.06	0.20		0.02	0.18	0.01	c0.03	c0.23	0.05
v/s Ratio Perm									0.03			0.10
v/c Ratio	0.78	0.65		0.54	0.69		0.46	0.60	0.08	0.66	0.76	0.28
Uniform Delay, d1	31.3	21.6		33.6	25.4		36.8	24.1	14.8	36.9	25.3	12.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.3	1.4		1.7	2.3		1.5	2.5	0.0	13.4	7.3	0.1
Delay (s)	42.6	23.0		35.4	27.8		38.3	26.5	14.9	50.4	32.7	12.9
Level of Service	D	C		D	C		D	C	B	D	C	B
Approach Delay (s)		27.6			28.7			24.0			25.6	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM 2000 Control Delay	26.8	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.75			
Actuated Cycle Length (s)	79.2	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	65.8%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	279	594	55	137	467	86	52	315	167	109	334	313
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3423		1770	3386		1770	1827	1564	1770	1827	1564
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3423		1770	3386		1770	1827	1564	1770	1827	1564
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	282	600	56	138	472	87	53	318	169	110	337	316
RTOR Reduction (vph)	0	7	0	0	17	0	0	0	68	0	0	95
Lane Group Flow (vph)	282	649	0	138	542	0	53	318	101	110	337	221
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	15.3	26.1		9.3	20.1		4.1	22.5	31.8	7.7	26.1	41.4
Effective Green, g (s)	15.3	26.1		9.3	20.1		4.1	22.5	31.8	7.7	26.1	41.4
Actuated g/C Ratio	0.19	0.32		0.11	0.25		0.05	0.28	0.39	0.09	0.32	0.51
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	331	1094		201	834		88	503	686	167	584	870
v/s Ratio Prot	c0.16	c0.19		0.08	0.16		0.03	0.17	0.02	c0.06	c0.18	0.05
v/s Ratio Perm									0.05			0.09
v/c Ratio	0.85	0.59		0.69	0.65		0.60	0.63	0.15	0.66	0.58	0.25
Uniform Delay, d1	32.1	23.3		34.7	27.6		38.0	25.9	16.1	35.7	23.1	11.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.0	1.0		7.5	2.0		7.7	2.9	0.0	7.0	1.7	0.1
Delay (s)	50.0	24.3		42.3	29.6		45.7	28.8	16.2	42.6	24.8	11.4
Level of Service	D	C		D	C		D	C	B	D	C	B
Approach Delay (s)		32.0			32.1			26.5			21.8	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.69			
Actuated Cycle Length (s)	81.6	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	70.0%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	795	4	5	698	2	0	0	0	0	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	828	4	5	727	2	0	0	0	0	0	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked				0.82			0.82	0.82	0.82	0.82	0.82	
vC, conflicting volume	729			832			1205	1570	416	1153	1571	365
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	729			370			822	1264	0	758	1266	365
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	100	100	100	100
cM capacity (veh/h)	870			977			218	138	894	243	138	632

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	414	418	5	485	244	1
Volume Left	0	0	5	0	0	0
Volume Right	0	4	0	0	2	1
cSH	870	1700	977	1700	1700	632
Volume to Capacity	0.00	0.25	0.01	0.29	0.14	0.00
Queue Length 95th (ft)	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	8.7	0.0	0.0	10.7
Lane LOS			A			B
Approach Delay (s)	0.0		0.1			10.7
Approach LOS						B

Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			32.1%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	842	23	14	668	23	0	0	0	0	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	5	877	24	15	696	24	0	0	0	0	0	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	1.00			0.85			0.85	0.85	0.85	0.85	0.85	1.00
vC, conflicting volume	720			901			1299	1648	451	1186	1648	360
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	710			525			978	1388	0	844	1388	349
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	100	100	100	100	96
cM capacity (veh/h)	881			880			165	118	920	214	118	644

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	444	462	15	464	256	23
Volume Left	5	0	15	0	0	0
Volume Right	0	24	0	0	24	23
cSH	881	1700	880	1700	1700	644
Volume to Capacity	0.01	0.27	0.02	0.27	0.15	0.04
Queue Length 95th (ft)	0	0	1	0	0	3
Control Delay (s)	0.2	0.0	9.2	0.0	0.0	10.8
Lane LOS	A		A			B
Approach Delay (s)	0.1		0.2			10.8
Approach LOS						B

Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			37.5%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	682	165	70	703	15	184	81	55	40	80	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.94			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3350		1770	3459		1770	1707			1754	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3350		1770	3459		1770	1707			1754	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	27	726	176	74	748	16	196	86	59	43	85	39
RTOR Reduction (vph)	0	14	0	0	1	0	0	26	0	0	0	0
Lane Group Flow (vph)	27	888	0	74	763	0	196	119	0	0	167	0
Confl. Peds. (#/hr)	1		7	7		1			2	2		
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	3.6	51.6		8.6	56.6		18.7	18.7			17.1	
Effective Green, g (s)	3.6	51.6		8.6	56.6		18.7	18.7			17.1	
Actuated g/C Ratio	0.03	0.46		0.08	0.51		0.17	0.17			0.15	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	56	1543		135	1748		295	285			267	
v/s Ratio Prot	0.02	c0.27		c0.04	0.22		c0.11	0.07			c0.10	
v/s Ratio Perm												
v/c Ratio	0.48	0.58		0.55	0.44		0.66	0.42			0.63	
Uniform Delay, d1	53.3	22.2		49.8	17.6		43.7	41.8			44.5	
Progression Factor	0.86	0.76		0.64	0.83		1.00	1.00			1.00	
Incremental Delay, d2	2.3	1.5		2.1	0.7		5.0	0.7			3.9	
Delay (s)	48.1	18.4		34.0	15.3		48.7	42.5			48.4	
Level of Service	D	B		C	B		D	D			D	
Approach Delay (s)		19.3			16.9			46.1			48.4	
Approach LOS		B			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.60			
Actuated Cycle Length (s)	112.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	61.4%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	777	199	65	619	18	211	130	60	56	65	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.95			0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1770	3311		1770	3454		1770	1720			1717	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (perm)	1770	3311		1770	3454		1770	1720			1717	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	60	827	212	69	659	19	224	138	64	60	69	63
RTOR Reduction (vph)	0	17	0	0	1	0	0	17	0	0	0	0
Lane Group Flow (vph)	60	1022	0	69	677	0	224	185	0	0	192	0
Confl. Peds. (#/hr)	7		32	32		7	18		28	28		18
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	4.0	43.9		8.2	48.1		21.8	21.8			20.1	
Effective Green, g (s)	4.0	43.9		8.2	48.1		21.8	21.8			20.1	
Actuated g/C Ratio	0.04	0.40		0.07	0.44		0.20	0.20			0.18	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	64	1321		131	1510		350	340			313	
v/s Ratio Prot	0.03	c0.31		0.04	c0.20		c0.13	0.11			c0.11	
v/s Ratio Perm												
v/c Ratio	0.94	0.77		0.53	0.45		0.64	0.54			0.61	
Uniform Delay, d1	52.9	28.7		49.0	21.7		40.5	39.6			41.4	
Progression Factor	1.00	1.00		1.39	1.05		1.00	1.00			1.00	
Incremental Delay, d2	88.7	4.5		1.2	0.6		3.5	1.4			3.0	
Delay (s)	141.6	33.2		69.4	23.3		44.0	41.0			44.4	
Level of Service	F	C		E	C		D	D			D	
Approach Delay (s)		39.1			27.6			42.6			44.4	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	36.6	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.69			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	82.4%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1145	154	380	933	0	0	0	0	247	0	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1245	167	413	1014	0	0	0	0	268	0	422
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	0	0	0	92
Lane Group Flow (vph)	0	1245	121	413	1014	0	0	0	0	0	268	330
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		43.0	43.0	16.0	63.0						29.0	29.0
Effective Green, g (s)		43.0	43.0	16.0	63.0						29.0	29.0
Actuated g/C Ratio		0.43	0.43	0.16	0.63						0.29	0.29
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1521	667	538	2229						503	450
v/s Ratio Prot		c0.35	0.08	c0.12	0.29							
v/s Ratio Perm											0.15	c0.21
v/c Ratio		0.82	0.18	0.77	0.45						0.53	0.73
Uniform Delay, d1		25.1	17.6	40.2	9.6						29.8	32.0
Progression Factor		1.00	1.00	0.99	0.73						1.00	1.00
Incremental Delay, d2		5.0	0.6	6.2	0.6						1.1	10.1
Delay (s)		30.1	18.2	46.2	7.7						30.9	42.1
Level of Service		C	B	D	A						C	D
Approach Delay (s)		28.7			18.8			0.0			37.8	
Approach LOS		C			B			A			D	

Intersection Summary				
HCM 2000 Control Delay	26.5	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	66.2%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1310	117	253	1083	0	0	0	0	303	4	345
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1741	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1741	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1424	127	275	1177	0	0	0	0	329	4	375
RTOR Reduction (vph)	0	0	31	0	0	0	0	0	0	0	0	76
Lane Group Flow (vph)	0	1424	96	275	1177	0	0	0	0	0	333	299
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		43.0	43.0	19.0	66.0						26.0	26.0
Effective Green, g (s)		43.0	43.0	19.0	66.0						26.0	26.0
Actuated g/C Ratio		0.43	0.43	0.19	0.66						0.26	0.26
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1521	667	639	2335						452	403
v/s Ratio Prot		c0.40	0.06	0.08	c0.33							
v/s Ratio Perm											0.19	c0.19
v/c Ratio		0.94	0.14	0.43	0.50						0.74	0.74
Uniform Delay, d1		27.2	17.3	35.7	8.7						33.9	33.9
Progression Factor		1.00	1.00	1.10	1.22						1.00	1.00
Incremental Delay, d2		12.2	0.5	0.4	0.7						6.2	11.6
Delay (s)		39.4	17.8	39.6	11.3						40.0	45.6
Level of Service		D	B	D	B						D	D
Approach Delay (s)		37.6			16.7			0.0			43.0	
Approach LOS		D			B			A			D	

Intersection Summary				
HCM 2000 Control Delay	30.4	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.80			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	70.4%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

3/24/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1018	408	0	1406	129	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1072	429	0	1480	136	242
RTOR Reduction (vph)	0	75	0	0	0	217
Lane Group Flow (vph)	1072	354	0	1480	136	25
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	82.6	82.6		82.6	9.4	9.4
Effective Green, g (s)	82.6	82.6		82.6	9.4	9.4
Actuated g/C Ratio	0.83	0.83		0.83	0.09	0.09
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2923	1307		3830	316	256
v/s Ratio Prot	0.30			c0.32		
v/s Ratio Perm		0.22			c0.04	0.01
v/c Ratio	0.37	0.27		0.39	0.43	0.10
Uniform Delay, d1	2.2	2.0		2.2	42.8	41.4
Progression Factor	0.13	0.00		1.89	1.00	1.00
Incremental Delay, d2	0.3	0.4		0.2	0.9	0.2
Delay (s)	0.6	0.4		4.4	43.7	41.6
Level of Service	A	A		A	D	D
Approach Delay (s)	0.5			4.4	42.3	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.39			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	42.9%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

3/24/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1260	359	0	1493	143	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1326	378	0	1572	151	395
RTOR Reduction (vph)	0	88	0	0	0	121
Lane Group Flow (vph)	1326	290	0	1572	151	274
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	76.8	76.8		76.8	15.2	15.2
Effective Green, g (s)	76.8	76.8		76.8	15.2	15.2
Actuated g/C Ratio	0.77	0.77		0.77	0.15	0.15
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2717	1215		3561	511	415
v/s Ratio Prot	c0.37			0.34		
v/s Ratio Perm		0.18			0.04	c0.10
v/c Ratio	0.49	0.24		0.44	0.30	0.66
Uniform Delay, d1	4.3	3.3		4.1	37.6	40.0
Progression Factor	2.87	11.44		1.89	1.00	1.00
Incremental Delay, d2	0.4	0.3		0.2	0.3	3.8
Delay (s)	12.8	38.0		7.9	38.0	43.7
Level of Service	B	D		A	D	D
Approach Delay (s)	18.4			7.9	42.1	
Approach LOS	B			A	D	

Intersection Summary				
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	54.6%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/27/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	718	470	177	735	812
Future Volume (vph)	0	718	470	177	735	812
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	789	516	195	808	892
RTOR Reduction (vph)	0	0	0	0	0	246
Lane Group Flow (vph)	0	789	516	195	808	646
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		38.3	38.3	73.3	27.0	27.0
Effective Green, g (s)		38.3	38.3	73.3	27.0	27.0
Actuated g/C Ratio		0.52	0.52	1.00	0.37	0.37
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1779	1849	1524	1216	987
v/s Ratio Prot		c0.23	0.15			
v/s Ratio Perm				0.13	c0.24	0.24
v/c Ratio		0.44	0.28	0.13	0.66	0.65
Uniform Delay, d1		10.9	9.8	0.0	19.4	19.3
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.8	0.4	0.2	1.4	1.6
Delay (s)		11.7	10.2	0.2	20.7	20.8
Level of Service		B	B	A	C	C
Approach Delay (s)		11.7	7.4		20.8	
Approach LOS		B	A		C	

Intersection Summary				
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.53			
Actuated Cycle Length (s)	73.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/28/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1109	502	328	407	521
Future Volume (vph)	0	1109	502	328	407	521
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1143	518	338	420	537
RTOR Reduction (vph)	0	0	0	0	0	446
Lane Group Flow (vph)	0	1143	518	338	420	91
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		66.0	66.0	89.1	15.1	15.1
Effective Green, g (s)		66.0	66.0	89.1	15.1	15.1
Actuated g/C Ratio		0.74	0.74	1.00	0.17	0.17
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2522	2621	1524	559	454
v/s Ratio Prot		c0.34	0.15			
v/s Ratio Perm				0.22	c0.13	0.03
v/c Ratio		0.45	0.20	0.22	0.75	0.20
Uniform Delay, d1		4.5	3.5	0.0	35.2	31.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.6	0.2	0.3	5.6	0.2
Delay (s)		5.1	3.7	0.3	40.9	32.0
Level of Service		A	A	A	D	C
Approach Delay (s)		5.1	2.4		35.9	
Approach LOS		A	A		D	

Intersection Summary				
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	89.1	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	984	349	0	918	113	390
Future Volume (vph)	984	349	0	918	113	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1047	371	0	977	120	415
RTOR Reduction (vph)	0	0	0	0	0	115
Lane Group Flow (vph)	1047	371	0	977	120	300
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	48.1	68.8		48.1	12.7	12.7
Effective Green, g (s)	48.1	68.8		48.1	12.7	12.7
Actuated g/C Ratio	0.70	1.00		0.70	0.18	0.18
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2381	1583		2381	609	495
v/s Ratio Prot	c0.31			0.29		
v/s Ratio Perm		0.23			0.04	c0.11
v/c Ratio	0.44	0.23		0.41	0.20	0.61
Uniform Delay, d1	4.5	0.0		4.4	23.7	25.8
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.3		0.5	0.2	2.1
Delay (s)	5.1	0.3		4.9	23.9	27.9
Level of Service	A	A		A	C	C
Approach Delay (s)	3.8			4.9	27.0	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	68.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	47.5%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	806	585	0	1398	83	258
Future Volume (vph)	806	585	0	1398	83	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	840	609	0	1456	86	269
RTOR Reduction (vph)	0	0	0	0	0	242
Lane Group Flow (vph)	840	609	0	1456	86	27
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	58.4	73.8		58.4	7.4	7.4
Effective Green, g (s)	58.4	73.8		58.4	7.4	7.4
Actuated g/C Ratio	0.79	1.00		0.79	0.10	0.10
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2695	1583		2695	331	268
v/s Ratio Prot	0.25			c0.43		
v/s Ratio Perm		c0.38			0.03	0.01
v/c Ratio	0.31	0.38		0.54	0.26	0.10
Uniform Delay, d1	2.1	0.0		2.8	30.7	30.2
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	0.7		0.8	0.4	0.2
Delay (s)	2.4	0.7		3.6	31.1	30.3
Level of Service	A	A		A	C	C
Approach Delay (s)	1.7			3.6	30.5	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.55			
Actuated Cycle Length (s)	73.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	0	35	0	146	0	493	56	153	707	1
Future Volume (vph)	4	0	0	35	0	146	0	493	56	153	707	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98			1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		1.00			0.89			0.98		1.00	1.00	
Flt Protected		0.95			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1770			1605			3414		1770	3470	
Flt Permitted		0.46			0.94			1.00		0.95	1.00	
Satd. Flow (perm)		860			1523			3414		1770	3470	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	5	0	0	40	0	166	0	560	64	174	803	1
RTOR Reduction (vph)	0	0	0	0	138	0	0	9	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	68	0	0	615	0	174	804	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		10.6			10.6			30.6		9.7	44.3	
Effective Green, g (s)		10.6			10.6			31.1		9.7	44.8	
Actuated g/C Ratio		0.17			0.17			0.49		0.15	0.71	
Clearance Time (s)		4.0			4.0			4.5		4.0	4.5	
Vehicle Extension (s)		4.0			4.0			4.0		1.0	4.0	
Lane Grp Cap (vph)		143			254			1674		270	2451	
v/s Ratio Prot								c0.18		c0.10	0.23	
v/s Ratio Perm		0.01			c0.04							
v/c Ratio		0.03			0.27			0.37		0.64	0.33	
Uniform Delay, d1		22.1			23.0			10.0		25.2	3.6	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.8			0.6		3.9	0.1	
Delay (s)		22.3			23.8			10.7		29.1	3.7	
Level of Service		C			C			B		C	A	
Approach Delay (s)		22.3			23.8			10.7			8.2	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.40			
Actuated Cycle Length (s)	63.4	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	44.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	3	1	67	0	253	2	780	40	142	655	1
Future Volume (vph)	2	3	1	67	0	253	2	780	40	142	655	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.89		1.00	0.99		1.00	1.00	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1782			1612		1770	3444		1770	3470	
Flt Permitted		0.93			0.93		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1684			1516		1770	3444		1770	3470	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	2	3	1	69	0	261	2	804	41	146	675	1
RTOR Reduction (vph)	0	1	0	0	154	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	176	0	2	841	0	146	676	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		11.3			11.3		0.7	23.1		6.9	29.3	
Effective Green, g (s)		11.3			11.3		0.7	23.6		6.9	29.8	
Actuated g/C Ratio		0.21			0.21		0.01	0.44		0.13	0.55	
Clearance Time (s)		4.0			4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)		2.0			2.0		2.0	4.0		1.0	4.0	
Lane Grp Cap (vph)		353			318		23	1510		227	1922	
v/s Ratio Prot							0.00	c0.24		c0.08	0.19	
v/s Ratio Perm		0.00			c0.12							
v/c Ratio		0.01			0.55		0.09	0.56		0.64	0.35	
Uniform Delay, d1		16.8			19.0		26.2	11.2		22.3	6.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			1.2		0.6	0.6		4.6	0.2	
Delay (s)		16.8			20.2		26.8	11.8		26.9	6.8	
Level of Service		B			C		C	B		C	A	
Approach Delay (s)		16.8			20.2			11.8			10.4	
Approach LOS		B			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	53.8	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	63.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	83	1	18	28	2	10	8	497	16	4	743	95
Future Volume (Veh/h)	83	1	18	28	2	10	8	497	16	4	743	95
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	92	1	20	31	2	11	9	552	18	4	826	106
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.93	0.93		0.93	0.93	0.93				0.93		
vC, conflicting volume	1469	1475	879	1434	1519	561	932			570		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1467	1473	879	1428	1521	487	932			496		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	2	99	94	68	98	98	99			100		
cM capacity (veh/h)	94	115	347	96	108	538	734			989		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	113	44	9	570	4	932
Volume Left	92	31	9	0	4	0
Volume Right	20	11	0	18	0	106
cSH	108	122	734	1700	989	1700
Volume to Capacity	1.05	0.36	0.01	0.34	0.00	0.55
Queue Length 95th (ft)	171	37	1	0	0	0
Control Delay (s)	175.6	50.2	10.0	0.0	8.7	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	175.6	50.2	0.2		0.0	
Approach LOS	F	F				

Intersection Summary					
Average Delay	13.3				
Intersection Capacity Utilization	58.5%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	2	12	26	2	9	4	764	36	8	657	63
Future Volume (Veh/h)	103	2	12	26	2	9	4	764	36	8	657	63
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	114	2	13	29	2	10	4	849	40	9	730	70
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.88	0.88		0.88	0.88	0.88				0.88		
vC, conflicting volume	1651	1680	765	1639	1695	869	800			889		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1672	1705	765	1658	1722	781	800			804		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	97	97	55	97	97	100			99		
cM capacity (veh/h)	63	79	403	64	77	346	823			720		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	129	41	4	889	9	800
Volume Left	114	29	4	0	9	0
Volume Right	13	10	0	40	0	70
cSH	69	81	823	1700	720	1700
Volume to Capacity	1.87	0.51	0.00	0.52	0.01	0.47
Queue Length 95th (ft)	292	54	0	0	1	0
Control Delay (s)	541.5	88.8	9.4	0.0	10.1	0.0
Lane LOS	F	F	A		B	
Approach Delay (s)	541.5	88.8	0.0		0.1	
Approach LOS	F	F				

Intersection Summary					
Average Delay	39.3				
Intersection Capacity Utilization	57.2%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	216	618	84	90	570	50	34	266	128	71	342	293
Future Volume (vph)	216	618	84	90	570	50	34	266	128	71	342	293
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3404		1770	3426		1770	1644	1563	1770	1644	1563
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3404		1770	3426		1770	1644	1563	1770	1644	1563
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	240	687	93	100	633	56	38	296	142	79	380	326
RTOR Reduction (vph)	0	11	0	0	7	0	0	0	70	0	0	94
Lane Group Flow (vph)	240	769	0	100	682	0	38	296	72	79	380	232
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Parking (#/hr)								0			0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	13.6	28.0		8.3	22.7		3.8	23.9	32.2	5.7	25.8	39.4
Effective Green, g (s)	13.6	28.0		8.3	22.7		3.8	23.9	32.2	5.7	25.8	39.4
Actuated g/C Ratio	0.17	0.34		0.10	0.28		0.05	0.29	0.39	0.07	0.32	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	293	1163		179	949		82	479	690	123	517	828
v/s Ratio Prot	c0.14	c0.23		0.06	0.20		0.02	0.18	0.01	c0.04	c0.23	0.05
v/s Ratio Perm									0.04			0.10
v/c Ratio	0.82	0.66		0.56	0.72		0.46	0.62	0.10	0.64	0.74	0.28
Uniform Delay, d1	33.0	22.9		35.1	26.7		38.1	25.1	15.7	37.1	25.0	12.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.4	1.6		2.1	2.8		1.5	2.7	0.0	8.3	5.7	0.1
Delay (s)	48.4	24.5		37.2	29.5		39.6	27.8	15.7	45.4	30.7	12.8
Level of Service	D	C		D	C		D	C	B	D	C	B
Approach Delay (s)		30.1			30.5			25.1			24.8	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM 2000 Control Delay	28.1	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	81.9	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	66.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	281	594	55	137	467	110	52	324	167	126	341	315
Future Volume (vph)	281	594	55	137	467	110	52	324	167	126	341	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3423		1770	3366		1770	1827	1564	1770	1827	1564
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3423		1770	3366		1770	1827	1564	1770	1827	1564
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	284	600	56	138	472	111	53	327	169	127	344	318
RTOR Reduction (vph)	0	7	0	0	22	0	0	0	62	0	0	95
Lane Group Flow (vph)	284	649	0	138	561	0	53	327	107	127	344	223
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	15.3	26.8		9.3	20.8		4.2	23.0	32.3	8.1	26.9	42.2
Effective Green, g (s)	15.3	26.8		9.3	20.8		4.2	23.0	32.3	8.1	26.9	42.2
Actuated g/C Ratio	0.18	0.32		0.11	0.25		0.05	0.28	0.39	0.10	0.32	0.51
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	325	1102		197	841		89	505	682	172	590	868
v/s Ratio Prot	c0.16	0.19		0.08	c0.17		0.03	c0.18	0.02	c0.07	c0.19	0.05
v/s Ratio Perm									0.05			0.10
v/c Ratio	0.87	0.59		0.70	0.67		0.60	0.65	0.16	0.74	0.58	0.26
Uniform Delay, d1	33.0	23.6		35.6	28.1		38.7	26.5	16.6	36.5	23.5	11.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	21.4	1.0		8.8	2.2		6.9	3.2	0.0	13.3	1.7	0.1
Delay (s)	54.4	24.5		44.4	30.3		45.6	29.7	16.6	49.8	25.2	11.7
Level of Service	D	C		D	C		D	C	B	D	C	B
Approach Delay (s)		33.6			33.0			27.2			23.7	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM 2000 Control Delay	29.7	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	83.2	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	72.1%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	813	4	5	709	2	0	0	0	0	0	1
Future Volume (Veh/h)	0	813	4	5	709	2	0	0	0	0	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	847	4	5	739	2	0	0	0	0	0	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked				0.82			0.82	0.82	0.82	0.82	0.82	
vC, conflicting volume	741			851			1230	1600	426	1174	1601	370
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	741			383			844	1295	0	776	1296	370
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	100	100	100	100
cM capacity (veh/h)	862			962			209	132	890	235	131	627

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	424	428	5	493	248	1
Volume Left	0	0	5	0	0	0
Volume Right	0	4	0	0	2	1
cSH	862	1700	962	1700	1700	627
Volume to Capacity	0.00	0.25	0.01	0.29	0.15	0.00
Queue Length 95th (ft)	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	8.8	0.0	0.0	10.8
Lane LOS			A			B
Approach Delay (s)	0.0		0.1			10.8
Approach LOS						B

Intersection Summary					
Average Delay	0.0				
Intersection Capacity Utilization	32.6%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	859	23	14	692	23	0	0	0	0	0	22
Future Volume (Veh/h)	5	859	23	14	692	23	0	0	0	0	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	5	895	24	15	721	24	0	0	0	0	0	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.99			0.85			0.85	0.85	0.85	0.85	0.85	0.99
vC, conflicting volume	745			919			1330	1692	460	1220	1692	372
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	718			547			983	1406	5	855	1406	341
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	100	100	100	100	96
cM capacity (veh/h)	869			864			164	115	913	211	115	647

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	452	472	15	481	264	23
Volume Left	5	0	15	0	0	0
Volume Right	0	24	0	0	24	23
cSH	869	1700	864	1700	1700	647
Volume to Capacity	0.01	0.28	0.02	0.28	0.16	0.04
Queue Length 95th (ft)	0	0	1	0	0	3
Control Delay (s)	0.2	0.0	9.2	0.0	0.0	10.8
Lane LOS	A		A			B
Approach Delay (s)	0.1		0.2			10.8
Approach LOS						B

Intersection Summary					
Average Delay	0.3				
Intersection Capacity Utilization	38.0%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	697	168	70	712	15	186	81	55	40	80	37
Future Volume (vph)	25	697	168	70	712	15	186	81	55	40	80	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.94			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3350		1770	3460		1770	1707			1754	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3350		1770	3460		1770	1707			1754	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	27	741	179	74	757	16	198	86	59	43	85	39
RTOR Reduction (vph)	0	14	0	0	1	0	0	26	0	0	0	0
Lane Group Flow (vph)	27	906	0	74	772	0	198	119	0	0	167	0
Confl. Peds. (#/hr)	1		7	7		1			2	2		
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	3.6	51.5		8.6	56.5		18.8	18.8			17.1	
Effective Green, g (s)	3.6	51.5		8.6	56.5		18.8	18.8			17.1	
Actuated g/C Ratio	0.03	0.46		0.08	0.50		0.17	0.17			0.15	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	56	1540		135	1745		297	286			267	
v/s Ratio Prot	0.02	c0.27		c0.04	0.22		c0.11	0.07			c0.10	
v/s Ratio Perm												
v/c Ratio	0.48	0.59		0.55	0.44		0.67	0.42			0.63	
Uniform Delay, d1	53.3	22.4		49.8	17.7		43.7	41.7			44.5	
Progression Factor	0.86	0.76		0.64	0.83		1.00	1.00			1.00	
Incremental Delay, d2	2.3	1.6		2.1	0.7		5.0	0.7			3.9	
Delay (s)	48.3	18.6		34.2	15.4		48.7	42.4			48.4	
Level of Service	D	B		C	B		D	D			D	
Approach Delay (s)		19.5			17.0			46.0			48.4	
Approach LOS		B			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	112.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	62.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	791	202	65	640	18	214	130	60	56	65	59
Future Volume (vph)	56	791	202	65	640	18	214	130	60	56	65	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.95			0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1770	3312		1770	3454		1770	1720			1717	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (perm)	1770	3312		1770	3454		1770	1720			1717	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	60	841	215	69	681	19	228	138	64	60	69	63
RTOR Reduction (vph)	0	17	0	0	1	0	0	17	0	0	0	0
Lane Group Flow (vph)	60	1039	0	69	699	0	228	185	0	0	192	0
Confl. Peds. (#/hr)	7		32	32		7	18		28	28		18
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	4.0	43.8		8.2	48.0		21.9	21.9			20.1	
Effective Green, g (s)	4.0	43.8		8.2	48.0		21.9	21.9			20.1	
Actuated g/C Ratio	0.04	0.40		0.07	0.44		0.20	0.20			0.18	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	64	1318		131	1507		352	342			313	
v/s Ratio Prot	0.03	c0.31		0.04	c0.20		c0.13	0.11			c0.11	
v/s Ratio Perm												
v/c Ratio	0.94	0.79		0.53	0.46		0.65	0.54			0.61	
Uniform Delay, d1	52.9	29.0		49.0	21.9		40.5	39.5			41.4	
Progression Factor	1.00	1.00		1.39	1.05		1.00	1.00			1.00	
Incremental Delay, d2	88.7	4.8		1.2	0.7		3.6	1.4			3.0	
Delay (s)	141.6	33.9		69.5	23.7		44.1	40.9			44.4	
Level of Service	F	C		E	C		D	D			D	
Approach Delay (s)		39.7			27.8			42.6			44.4	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	36.9	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	82.9%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1159	155	380	941	0	0	0	0	247	0	390
Future Volume (vph)	0	1159	155	380	941	0	0	0	0	247	0	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1260	168	413	1023	0	0	0	0	268	0	424
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	0	0	0	91
Lane Group Flow (vph)	0	1260	122	413	1023	0	0	0	0	0	268	333
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		43.0	43.0	16.0	63.0						29.0	29.0
Effective Green, g (s)		43.0	43.0	16.0	63.0						29.0	29.0
Actuated g/C Ratio		0.43	0.43	0.16	0.63						0.29	0.29
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1521	667	538	2229						503	450
v/s Ratio Prot		c0.36	0.08	c0.12	0.29							
v/s Ratio Perm											0.15	c0.21
v/c Ratio		0.83	0.18	0.77	0.46						0.53	0.74
Uniform Delay, d1		25.2	17.6	40.2	9.6						29.8	32.1
Progression Factor		1.00	1.00	0.99	0.73						1.00	1.00
Incremental Delay, d2		5.3	0.6	6.2	0.7						1.1	10.5
Delay (s)		30.6	18.2	46.2	7.7						30.9	42.6
Level of Service		C	B	D	A						C	D
Approach Delay (s)		29.1			18.8			0.0			38.0	
Approach LOS		C			B			A			D	

Intersection Summary				
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.79			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	66.6%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1323	118	253	1100	0	0	0	0	303	1	348
Future Volume (vph)	0	1323	118	253	1100	0	0	0	0	303	1	348
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1740	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1740	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1438	128	275	1196	0	0	0	0	329	1	378
RTOR Reduction (vph)	0	0	31	0	0	0	0	0	0	0	0	73
Lane Group Flow (vph)	0	1438	97	275	1196	0	0	0	0	0	330	305
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		43.0	43.0	19.0	66.0						26.0	26.0
Effective Green, g (s)		43.0	43.0	19.0	66.0						26.0	26.0
Actuated g/C Ratio		0.43	0.43	0.19	0.66						0.26	0.26
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1521	667	639	2335						452	403
v/s Ratio Prot		c0.41	0.06	0.08	c0.34							
v/s Ratio Perm											0.19	c0.20
v/c Ratio		0.95	0.14	0.43	0.51						0.73	0.76
Uniform Delay, d1		27.4	17.3	35.7	8.7						33.8	34.1
Progression Factor		1.00	1.00	1.09	1.21						1.00	1.00
Incremental Delay, d2		13.3	0.5	0.4	0.8						6.0	12.4
Delay (s)		40.7	17.8	39.5	11.4						39.8	46.5
Level of Service		D	B	D	B						D	D
Approach Delay (s)		38.8			16.6			0.0			43.4	
Approach LOS		D			B			A			D	

Intersection Summary				
HCM 2000 Control Delay	31.0	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.81			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	70.6%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1032	408	0	1413	130	230
Future Volume (vph)	1032	408	0	1413	130	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1086	429	0	1487	137	242
RTOR Reduction (vph)	0	75	0	0	0	212
Lane Group Flow (vph)	1086	354	0	1487	137	30
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	82.6	82.6		82.6	9.4	9.4
Effective Green, g (s)	82.6	82.6		82.6	9.4	9.4
Actuated g/C Ratio	0.83	0.83		0.83	0.09	0.09
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2923	1307		3830	316	256
v/s Ratio Prot	0.31			c0.32		
v/s Ratio Perm		0.22			c0.04	0.01
v/c Ratio	0.37	0.27		0.39	0.43	0.12
Uniform Delay, d1	2.2	2.0		2.2	42.8	41.5
Progression Factor	0.14	0.00		1.88	1.00	1.00
Incremental Delay, d2	0.3	0.4		0.2	1.0	0.2
Delay (s)	0.6	0.4		4.4	43.7	41.7
Level of Service	A	A		A	D	D
Approach Delay (s)	0.5			4.4	42.4	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1273	359	0	1509	144	375
Future Volume (vph)	1273	359	0	1509	144	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1340	378	0	1588	152	395
RTOR Reduction (vph)	0	88	0	0	0	118
Lane Group Flow (vph)	1340	290	0	1588	152	277
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	76.7	76.7		76.7	15.3	15.3
Effective Green, g (s)	76.7	76.7		76.7	15.3	15.3
Actuated g/C Ratio	0.77	0.77		0.77	0.15	0.15
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2714	1214		3557	515	418
v/s Ratio Prot	c0.38			0.34		
v/s Ratio Perm		0.18			0.05	c0.10
v/c Ratio	0.49	0.24		0.45	0.30	0.66
Uniform Delay, d1	4.4	3.3		4.1	37.6	39.9
Progression Factor	2.85	11.29		1.89	1.00	1.00
Incremental Delay, d2	0.4	0.3		0.2	0.3	3.9
Delay (s)	12.8	37.8		8.0	37.9	43.9
Level of Service	B	D		A	D	D
Approach Delay (s)	18.3			8.0	42.2	
Approach LOS	B			A	D	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	1	18	28	2	10	8	497	16	4	743	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.97		1.00	1.00		1.00	0.98	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1747			1739		1770	1819		1770	1800	
Flt Permitted		0.74			0.81		0.21	1.00		0.41	1.00	
Satd. Flow (perm)		1337			1463		391	1819		765	1800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	92	1	20	31	2	11	9	552	18	4	826	106
RTOR Reduction (vph)	0	15	0	0	9	0	0	1	0	0	6	0
Lane Group Flow (vph)	0	98	0	0	35	0	9	569	0	4	926	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.6			7.6		36.8	36.8		36.8	36.8	
Effective Green, g (s)		7.6			7.6		36.8	36.8		36.8	36.8	
Actuated g/C Ratio		0.15			0.15		0.70	0.70		0.70	0.70	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		193			212		274	1277		537	1264	
v/s Ratio Prot								0.31			c0.51	
v/s Ratio Perm		c0.07			0.02		0.02			0.01		
v/c Ratio		0.51			0.16		0.03	0.45		0.01	0.73	
Uniform Delay, d1		20.7			19.6		2.4	3.4		2.3	4.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.1			0.4		0.0	0.2		0.0	2.2	
Delay (s)		22.7			20.0		2.4	3.6		2.3	7.0	
Level of Service		C			B		A	A		A	A	
Approach Delay (s)		22.7			20.0			3.6			7.0	
Approach LOS		C			B			A			A	

Intersection Summary				
HCM 2000 Control Delay	7.2	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.69			
Actuated Cycle Length (s)	52.4	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	58.5%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	103	2	12	26	2	9	4	764	36	8	657	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.97		1.00	0.99		1.00	0.99	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1760			1740		1770	1816		1770	1806	
Flt Permitted		0.72			0.82		0.28	1.00		0.23	1.00	
Satd. Flow (perm)		1326			1470		520	1816		434	1806	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	114	2	13	29	2	10	4	849	40	9	730	70
RTOR Reduction (vph)	0	8	0	0	8	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	121	0	0	33	0	4	887	0	9	796	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		9.3			9.3		42.5	42.5		42.5	42.5	
Effective Green, g (s)		9.3			9.3		42.5	42.5		42.5	42.5	
Actuated g/C Ratio		0.16			0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		206			228		369	1290		308	1283	
v/s Ratio Prot								c0.49			0.44	
v/s Ratio Perm		c0.09			0.02		0.01			0.02		
v/c Ratio		0.59			0.14		0.01	0.69		0.03	0.62	
Uniform Delay, d1		23.5			21.8		2.5	4.9		2.6	4.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		4.3			0.3		0.1	3.0		0.2	2.3	
Delay (s)		27.7			22.1		2.6	7.9		2.7	6.7	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		27.7			22.1			7.9			6.7	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	9.0	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	59.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	57.2%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/27/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	718	470	177	735	812
Future Volume (vph)	0	718	470	177	735	812
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	789	516	195	808	892
RTOR Reduction (vph)	0	0	0	0	0	246
Lane Group Flow (vph)	0	789	516	195	808	646
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		38.3	38.3	73.3	27.0	27.0
Effective Green, g (s)		38.3	38.3	73.3	27.0	27.0
Actuated g/C Ratio		0.52	0.52	1.00	0.37	0.37
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1779	1849	1524	1216	987
v/s Ratio Prot		c0.23	0.15			
v/s Ratio Perm				0.13	c0.24	0.24
v/c Ratio		0.44	0.28	0.13	0.66	0.65
Uniform Delay, d1		10.9	9.8	0.0	19.4	19.3
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.8	0.4	0.2	1.4	1.6
Delay (s)		11.7	10.2	0.2	20.7	20.8
Level of Service		B	B	A	C	C
Approach Delay (s)		11.7	7.4		20.8	
Approach LOS		B	A		C	

Intersection Summary				
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.53			
Actuated Cycle Length (s)	73.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/28/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1109	502	328	407	521
Future Volume (vph)	0	1109	502	328	407	521
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1143	518	338	420	537
RTOR Reduction (vph)	0	0	0	0	0	446
Lane Group Flow (vph)	0	1143	518	338	420	91
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		66.0	66.0	89.1	15.1	15.1
Effective Green, g (s)		66.0	66.0	89.1	15.1	15.1
Actuated g/C Ratio		0.74	0.74	1.00	0.17	0.17
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2522	2621	1524	559	454
v/s Ratio Prot		c0.34	0.15			
v/s Ratio Perm				0.22	c0.13	0.03
v/c Ratio		0.45	0.20	0.22	0.75	0.20
Uniform Delay, d1		4.5	3.5	0.0	35.2	31.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.6	0.2	0.3	5.6	0.2
Delay (s)		5.1	3.7	0.3	40.9	32.0
Level of Service		A	A	A	D	C
Approach Delay (s)		5.1	2.4		35.9	
Approach LOS		A	A		D	

Intersection Summary				
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	89.1	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	984	349	0	918	113	390
Future Volume (vph)	984	349	0	918	113	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1047	371	0	977	120	415
RTOR Reduction (vph)	0	0	0	0	0	115
Lane Group Flow (vph)	1047	371	0	977	120	300
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	48.1	68.8		48.1	12.7	12.7
Effective Green, g (s)	48.1	68.8		48.1	12.7	12.7
Actuated g/C Ratio	0.70	1.00		0.70	0.18	0.18
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2381	1583		2381	609	495
v/s Ratio Prot	c0.31			0.29		
v/s Ratio Perm		0.23			0.04	c0.11
v/c Ratio	0.44	0.23		0.41	0.20	0.61
Uniform Delay, d1	4.5	0.0		4.4	23.7	25.8
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.3		0.5	0.2	2.1
Delay (s)	5.1	0.3		4.9	23.9	27.9
Level of Service	A	A		A	C	C
Approach Delay (s)	3.8			4.9	27.0	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	68.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	47.5%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	806	585	0	1398	83	258
Future Volume (vph)	806	585	0	1398	83	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	840	609	0	1456	86	269
RTOR Reduction (vph)	0	0	0	0	0	242
Lane Group Flow (vph)	840	609	0	1456	86	27
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	58.4	73.8		58.4	7.4	7.4
Effective Green, g (s)	58.4	73.8		58.4	7.4	7.4
Actuated g/C Ratio	0.79	1.00		0.79	0.10	0.10
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2695	1583		2695	331	268
v/s Ratio Prot	0.25			c0.43		
v/s Ratio Perm		c0.38			0.03	0.01
v/c Ratio	0.31	0.38		0.54	0.26	0.10
Uniform Delay, d1	2.1	0.0		2.8	30.7	30.2
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	0.7		0.8	0.4	0.2
Delay (s)	2.4	0.7		3.6	31.1	30.3
Level of Service	A	A		A	C	C
Approach Delay (s)	1.7			3.6	30.5	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.55			
Actuated Cycle Length (s)	73.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	0	35	0	146	0	493	56	153	707	1
Future Volume (vph)	4	0	0	35	0	146	0	493	56	153	707	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98			1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		1.00			0.89			0.98		1.00	1.00	
Flt Protected		0.95			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1770			1605			3414		1770	3470	
Flt Permitted		0.46			0.94			1.00		0.95	1.00	
Satd. Flow (perm)		860			1523			3414		1770	3470	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	5	0	0	40	0	166	0	560	64	174	803	1
RTOR Reduction (vph)	0	0	0	0	138	0	0	9	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	68	0	0	615	0	174	804	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		10.6			10.6			30.6		9.7	44.3	
Effective Green, g (s)		10.6			10.6			31.1		9.7	44.8	
Actuated g/C Ratio		0.17			0.17			0.49		0.15	0.71	
Clearance Time (s)		4.0			4.0			4.5		4.0	4.5	
Vehicle Extension (s)		4.0			4.0			4.0		1.0	4.0	
Lane Grp Cap (vph)		143			254			1674		270	2451	
v/s Ratio Prot								c0.18		c0.10	0.23	
v/s Ratio Perm		0.01			c0.04							
v/c Ratio		0.03			0.27			0.37		0.64	0.33	
Uniform Delay, d1		22.1			23.0			10.0		25.2	3.6	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.8			0.6		3.9	0.1	
Delay (s)		22.3			23.8			10.7		29.1	3.7	
Level of Service		C			C			B		C	A	
Approach Delay (s)		22.3			23.8			10.7			8.2	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.40			
Actuated Cycle Length (s)	63.4	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	44.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	3	1	67	0	253	2	780	40	142	655	1
Future Volume (vph)	2	3	1	67	0	253	2	780	40	142	655	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.89		1.00	0.99		1.00	1.00	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1782			1612		1770	3444		1770	3470	
Flt Permitted		0.93			0.93		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1684			1516		1770	3444		1770	3470	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	2	3	1	69	0	261	2	804	41	146	675	1
RTOR Reduction (vph)	0	1	0	0	154	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	176	0	2	841	0	146	676	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		11.3			11.3		0.7	23.1		6.9	29.3	
Effective Green, g (s)		11.3			11.3		0.7	23.6		6.9	29.8	
Actuated g/C Ratio		0.21			0.21		0.01	0.44		0.13	0.55	
Clearance Time (s)		4.0			4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)		2.0			2.0		2.0	4.0		1.0	4.0	
Lane Grp Cap (vph)		353			318		23	1510		227	1922	
v/s Ratio Prot							0.00	c0.24		c0.08	0.19	
v/s Ratio Perm		0.00			c0.12							
v/c Ratio		0.01			0.55		0.09	0.56		0.64	0.35	
Uniform Delay, d1		16.8			19.0		26.2	11.2		22.3	6.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			1.2		0.6	0.6		4.6	0.2	
Delay (s)		16.8			20.2		26.8	11.8		26.9	6.8	
Level of Service		B			C		C	B		C	A	
Approach Delay (s)		16.8			20.2			11.8			10.4	
Approach LOS		B			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	53.8	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	63.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	83	1	18	24	2	10	8	497	7	4	743	95
Future Volume (Veh/h)	83	1	18	24	2	10	8	497	7	4	743	95
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	92	1	20	27	2	11	9	552	8	4	826	106
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.93	0.93		0.93	0.93	0.93				0.93		
vC, conflicting volume	1469	1465	879	1428	1514	556	932			560		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1467	1462	879	1423	1515	483	932			487		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	2	99	94	72	98	98	99			100		
cM capacity (veh/h)	94	117	347	97	109	542	734			998		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	113	40	9	560	4	932
Volume Left	92	27	9	0	4	0
Volume Right	20	11	0	8	0	106
cSH	108	127	734	1700	998	1700
Volume to Capacity	1.05	0.32	0.01	0.33	0.00	0.55
Queue Length 95th (ft)	171	31	1	0	0	0
Control Delay (s)	174.9	46.0	10.0	0.0	8.6	0.0
Lane LOS	F	E	A		A	
Approach Delay (s)	174.9	46.0	0.2		0.0	
Approach LOS	F	E				

Intersection Summary					
Average Delay	13.1				
Intersection Capacity Utilization	58.7%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	2	12	22	2	9	4	764	15	8	657	63
Future Volume (Veh/h)	103	2	12	22	2	9	4	764	15	8	657	63
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	114	2	13	24	2	10	4	849	17	9	730	70
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.88	0.88		0.88	0.88	0.88				0.88		
vC, conflicting volume	1651	1657	765	1628	1684	858	800			866		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1672	1679	765	1645	1709	769	800			779		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	98	97	63	97	97	100			99		
cM capacity (veh/h)	63	82	403	66	79	353	823			737		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	129	36	4	866	9	800
Volume Left	114	24	4	0	9	0
Volume Right	13	10	0	17	0	70
cSH	69	86	823	1700	737	1700
Volume to Capacity	1.87	0.42	0.00	0.51	0.01	0.47
Queue Length 95th (ft)	291	43	0	0	1	0
Control Delay (s)	538.4	74.5	9.4	0.0	9.9	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	538.4	74.5	0.0		0.1	
Approach LOS	F	F				

Intersection Summary					
Average Delay	39.2				
Intersection Capacity Utilization	56.2%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	216	618	84	94	570	41	34	266	128	71	338	293
Future Volume (vph)	216	618	84	94	570	41	34	266	128	71	338	293
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3404		1770	3434		1770	1644	1563	1770	1644	1564
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3404		1770	3434		1770	1644	1563	1770	1644	1564
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	240	687	93	104	633	46	38	296	142	79	376	326
RTOR Reduction (vph)	0	11	0	0	6	0	0	0	70	0	0	94
Lane Group Flow (vph)	240	769	0	104	673	0	38	296	72	79	376	232
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Parking (#/hr)								0			0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	13.6	27.6		8.4	22.4		3.8	23.8	32.2	5.6	25.6	39.2
Effective Green, g (s)	13.6	27.6		8.4	22.4		3.8	23.8	32.2	5.6	25.6	39.2
Actuated g/C Ratio	0.17	0.34		0.10	0.28		0.05	0.29	0.40	0.07	0.31	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	295	1154		182	944		82	480	695	121	517	830
v/s Ratio Prot	c0.14	c0.23		0.06	0.20		0.02	0.18	0.01	c0.04	c0.23	0.05
v/s Ratio Perm									0.04			0.10
v/c Ratio	0.81	0.67		0.57	0.71		0.46	0.62	0.10	0.65	0.73	0.28
Uniform Delay, d1	32.7	23.0		34.8	26.6		37.8	24.9	15.5	37.0	24.8	12.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.9	1.6		2.7	2.8		1.5	2.7	0.0	9.2	5.4	0.1
Delay (s)	47.6	24.6		37.5	29.4		39.3	27.6	15.5	46.2	30.2	12.7
Level of Service	D	C		D	C		D	C	B	D	C	B
Approach Delay (s)		30.0			30.4			24.9			24.5	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM 2000 Control Delay	27.9	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	81.4	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	66.1%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	281	594	55	141	467	89	52	324	167	126	338	315
Future Volume (vph)	281	594	55	141	467	89	52	324	167	126	338	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3423		1770	3383		1770	1827	1564	1770	1827	1564
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3423		1770	3383		1770	1827	1564	1770	1827	1564
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	284	600	56	142	472	90	53	327	169	127	341	318
RTOR Reduction (vph)	0	8	0	0	17	0	0	0	62	0	0	94
Lane Group Flow (vph)	284	648	0	142	545	0	53	327	107	127	341	224
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	15.3	26.1		9.4	20.2		4.2	22.9	32.3	8.1	26.8	42.1
Effective Green, g (s)	15.3	26.1		9.4	20.2		4.2	22.9	32.3	8.1	26.8	42.1
Actuated g/C Ratio	0.19	0.32		0.11	0.24		0.05	0.28	0.39	0.10	0.32	0.51
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	328	1082		201	828		90	507	688	173	593	873
v/s Ratio Prot	c0.16	c0.19		0.08	0.16		0.03	c0.18	0.02	c0.07	c0.19	0.05
v/s Ratio Perm									0.05			0.10
v/c Ratio	0.87	0.60		0.71	0.66		0.59	0.64	0.16	0.73	0.58	0.26
Uniform Delay, d1	32.6	23.8		35.2	28.0		38.3	26.2	16.3	36.2	23.1	11.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.9	1.1		8.9	2.1		6.2	3.1	0.0	13.0	1.6	0.1
Delay (s)	52.5	24.8		44.1	30.2		44.5	29.4	16.3	49.1	24.7	11.4
Level of Service	D	C		D	C		D	C	B	D	C	B
Approach Delay (s)		33.2			33.0			26.8			23.3	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM 2000 Control Delay	29.4	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	82.5	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	71.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	813	4	5	700	11	0	0	0	0	0	5
Future Volume (Veh/h)	0	813	4	5	700	11	0	0	0	0	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	847	4	5	729	11	0	0	0	0	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked				0.82			0.82	0.82	0.82	0.82	0.82	
vC, conflicting volume	740			851			1228	1599	426	1168	1596	370
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	740			381			841	1292	0	767	1288	370
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	100	100	100	99
cM capacity (veh/h)	862			964			209	132	890	238	133	627

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	424	428	5	486	254	5
Volume Left	0	0	5	0	0	0
Volume Right	0	4	0	0	11	5
cSH	862	1700	964	1700	1700	627
Volume to Capacity	0.00	0.25	0.01	0.29	0.15	0.01
Queue Length 95th (ft)	0	0	0	0	0	1
Control Delay (s)	0.0	0.0	8.8	0.0	0.0	10.8
Lane LOS			A			B
Approach Delay (s)	0.0		0.1			10.8
Approach LOS						B

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			32.6%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	859	23	14	671	44	0	0	0	0	0	26
Future Volume (Veh/h)	5	859	23	14	671	44	0	0	0	0	0	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	5	895	24	15	699	46	0	0	0	0	0	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.99			0.85			0.85	0.85	0.85	0.85	0.85	0.99
vC, conflicting volume	745			919			1324	1692	460	1210	1681	372
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	718			543			972	1404	1	838	1391	341
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	100	100	100	100	96
cM capacity (veh/h)	869			865			166	115	917	217	117	647

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	452	472	15	466	279	27
Volume Left	5	0	15	0	0	0
Volume Right	0	24	0	0	46	27
cSH	869	1700	865	1700	1700	647
Volume to Capacity	0.01	0.28	0.02	0.27	0.16	0.04
Queue Length 95th (ft)	0	0	1	0	0	3
Control Delay (s)	0.2	0.0	9.2	0.0	0.0	10.8
Lane LOS	A		A			B
Approach Delay (s)	0.1		0.2			10.8
Approach LOS						B

Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			38.0%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	697	168	70	712	15	186	81	55	40	80	37
Future Volume (vph)	25	697	168	70	712	15	186	81	55	40	80	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.94			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3350		1770	3460		1770	1707			1754	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3350		1770	3460		1770	1707			1754	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	27	741	179	74	757	16	198	86	59	43	85	39
RTOR Reduction (vph)	0	14	0	0	1	0	0	26	0	0	0	0
Lane Group Flow (vph)	27	906	0	74	772	0	198	119	0	0	167	0
Confl. Peds. (#/hr)	1		7	7		1			2	2		
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	3.6	51.5		8.6	56.5		18.8	18.8			17.1	
Effective Green, g (s)	3.6	51.5		8.6	56.5		18.8	18.8			17.1	
Actuated g/C Ratio	0.03	0.46		0.08	0.50		0.17	0.17			0.15	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	56	1540		135	1745		297	286			267	
v/s Ratio Prot	0.02	c0.27		c0.04	0.22		c0.11	0.07			c0.10	
v/s Ratio Perm												
v/c Ratio	0.48	0.59		0.55	0.44		0.67	0.42			0.63	
Uniform Delay, d1	53.3	22.4		49.8	17.7		43.7	41.7			44.5	
Progression Factor	0.86	0.76		0.64	0.83		1.00	1.00			1.00	
Incremental Delay, d2	2.3	1.6		2.1	0.7		5.0	0.7			3.9	
Delay (s)	48.3	18.6		34.2	15.4		48.7	42.4			48.4	
Level of Service	D	B		C	B		D	D			D	
Approach Delay (s)		19.5			17.0			46.0			48.4	
Approach LOS		B			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	112.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	62.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	791	202	65	640	18	214	130	60	56	65	59
Future Volume (vph)	56	791	202	65	640	18	214	130	60	56	65	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.95			0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1770	3312		1770	3454		1770	1720			1717	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (perm)	1770	3312		1770	3454		1770	1720			1717	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	60	841	215	69	681	19	228	138	64	60	69	63
RTOR Reduction (vph)	0	17	0	0	1	0	0	17	0	0	0	0
Lane Group Flow (vph)	60	1039	0	69	699	0	228	185	0	0	192	0
Confl. Peds. (#/hr)	7		32	32		7	18		28	28		18
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	4.0	43.8		8.2	48.0		21.9	21.9			20.1	
Effective Green, g (s)	4.0	43.8		8.2	48.0		21.9	21.9			20.1	
Actuated g/C Ratio	0.04	0.40		0.07	0.44		0.20	0.20			0.18	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	64	1318		131	1507		352	342			313	
v/s Ratio Prot	0.03	c0.31		0.04	c0.20		c0.13	0.11			c0.11	
v/s Ratio Perm												
v/c Ratio	0.94	0.79		0.53	0.46		0.65	0.54			0.61	
Uniform Delay, d1	52.9	29.0		49.0	21.9		40.5	39.5			41.4	
Progression Factor	1.00	1.00		1.39	1.05		1.00	1.00			1.00	
Incremental Delay, d2	88.7	4.8		1.2	0.7		3.6	1.4			3.0	
Delay (s)	141.6	33.9		69.5	23.7		44.1	40.9			44.4	
Level of Service	F	C		E	C		D	D			D	
Approach Delay (s)		39.7			27.8			42.6			44.4	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	36.9	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	82.9%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1159	155	380	941	0	0	0	0	247	0	390
Future Volume (vph)	0	1159	155	380	941	0	0	0	0	247	0	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1260	168	413	1023	0	0	0	0	268	0	424
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	0	0	0	91
Lane Group Flow (vph)	0	1260	122	413	1023	0	0	0	0	0	268	333
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		43.0	43.0	16.0	63.0						29.0	29.0
Effective Green, g (s)		43.0	43.0	16.0	63.0						29.0	29.0
Actuated g/C Ratio		0.43	0.43	0.16	0.63						0.29	0.29
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1521	667	538	2229						503	450
v/s Ratio Prot		c0.36	0.08	c0.12	0.29							
v/s Ratio Perm											0.15	c0.21
v/c Ratio		0.83	0.18	0.77	0.46						0.53	0.74
Uniform Delay, d1		25.2	17.6	40.2	9.6						29.8	32.1
Progression Factor		1.00	1.00	0.99	0.73						1.00	1.00
Incremental Delay, d2		5.3	0.6	6.2	0.7						1.1	10.5
Delay (s)		30.6	18.2	46.2	7.7						30.9	42.6
Level of Service		C	B	D	A						C	D
Approach Delay (s)		29.1			18.8			0.0			38.0	
Approach LOS		C			B			A			D	

Intersection Summary				
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.79			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	66.6%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1323	118	253	1100	0	0	0	0	303	1	348
Future Volume (vph)	0	1323	118	253	1100	0	0	0	0	303	1	348
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1740	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1740	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1438	128	275	1196	0	0	0	0	329	1	378
RTOR Reduction (vph)	0	0	31	0	0	0	0	0	0	0	0	73
Lane Group Flow (vph)	0	1438	97	275	1196	0	0	0	0	0	330	305
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		43.0	43.0	19.0	66.0						26.0	26.0
Effective Green, g (s)		43.0	43.0	19.0	66.0						26.0	26.0
Actuated g/C Ratio		0.43	0.43	0.19	0.66						0.26	0.26
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1521	667	639	2335						452	403
v/s Ratio Prot		c0.41	0.06	0.08	c0.34							
v/s Ratio Perm											0.19	c0.20
v/c Ratio		0.95	0.14	0.43	0.51						0.73	0.76
Uniform Delay, d1		27.4	17.3	35.7	8.7						33.8	34.1
Progression Factor		1.00	1.00	1.09	1.21						1.00	1.00
Incremental Delay, d2		13.3	0.5	0.4	0.8						6.0	12.4
Delay (s)		40.7	17.8	39.5	11.4						39.8	46.5
Level of Service		D	B	D	B						D	D
Approach Delay (s)		38.8			16.6				0.0		43.4	
Approach LOS		D			B				A		D	

Intersection Summary				
HCM 2000 Control Delay	31.0	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.81			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	70.6%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1032	408	0	1413	130	230
Future Volume (vph)	1032	408	0	1413	130	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1086	429	0	1487	137	242
RTOR Reduction (vph)	0	75	0	0	0	212
Lane Group Flow (vph)	1086	354	0	1487	137	30
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	82.6	82.6		82.6	9.4	9.4
Effective Green, g (s)	82.6	82.6		82.6	9.4	9.4
Actuated g/C Ratio	0.83	0.83		0.83	0.09	0.09
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2923	1307		3830	316	256
v/s Ratio Prot	0.31			c0.32		
v/s Ratio Perm		0.22			c0.04	0.01
v/c Ratio	0.37	0.27		0.39	0.43	0.12
Uniform Delay, d1	2.2	2.0		2.2	42.8	41.5
Progression Factor	0.14	0.00		1.88	1.00	1.00
Incremental Delay, d2	0.3	0.4		0.2	1.0	0.2
Delay (s)	0.6	0.4		4.4	43.7	41.7
Level of Service	A	A		A	D	D
Approach Delay (s)	0.5			4.4	42.4	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.39			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	43.2%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1273	359	0	1509	144	375
Future Volume (vph)	1273	359	0	1509	144	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1340	378	0	1588	152	395
RTOR Reduction (vph)	0	88	0	0	0	118
Lane Group Flow (vph)	1340	290	0	1588	152	277
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	76.7	76.7		76.7	15.3	15.3
Effective Green, g (s)	76.7	76.7		76.7	15.3	15.3
Actuated g/C Ratio	0.77	0.77		0.77	0.15	0.15
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2714	1214		3557	515	418
v/s Ratio Prot	c0.38			0.34		
v/s Ratio Perm		0.18			0.05	c0.10
v/c Ratio	0.49	0.24		0.45	0.30	0.66
Uniform Delay, d1	4.4	3.3		4.1	37.6	39.9
Progression Factor	2.85	11.29		1.89	1.00	1.00
Incremental Delay, d2	0.4	0.3		0.2	0.3	3.9
Delay (s)	12.8	37.8		8.0	37.9	43.9
Level of Service	B	D		A	D	D
Approach Delay (s)	18.3			8.0	42.2	
Approach LOS	B			A	D	

Intersection Summary				
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	55.0%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	1	18	24	2	10	8	497	7	4	743	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.96		1.00	1.00		1.00	0.98	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1747			1735		1770	1824		1770	1800	
Flt Permitted		0.74			0.82		0.21	1.00		0.42	1.00	
Satd. Flow (perm)		1342			1480		391	1824		776	1800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	92	1	20	27	2	11	9	552	8	4	826	106
RTOR Reduction (vph)	0	15	0	0	9	0	0	1	0	0	6	0
Lane Group Flow (vph)	0	98	0	0	31	0	9	559	0	4	926	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.6			7.6		36.9	36.9		36.9	36.9	
Effective Green, g (s)		7.6			7.6		36.9	36.9		36.9	36.9	
Actuated g/C Ratio		0.14			0.14		0.70	0.70		0.70	0.70	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		194			214		274	1282		545	1265	
v/s Ratio Prot								0.31			c0.51	
v/s Ratio Perm		c0.07			0.02		0.02			0.01		
v/c Ratio		0.50			0.14		0.03	0.44		0.01	0.73	
Uniform Delay, d1		20.7			19.6		2.4	3.3		2.3	4.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.0			0.3		0.0	0.2		0.0	2.2	
Delay (s)		22.8			19.9		2.4	3.6		2.3	7.0	
Level of Service		C			B		A	A		A	A	
Approach Delay (s)		22.8			19.9			3.6			7.0	
Approach LOS		C			B			A			A	

Intersection Summary				
HCM 2000 Control Delay	7.2	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.69			
Actuated Cycle Length (s)	52.5	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	58.7%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	103	2	12	22	2	9	4	764	15	8	657	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1760			1735		1770	1822		1770	1806	
Flt Permitted		0.72			0.83		0.28	1.00		0.25	1.00	
Satd. Flow (perm)		1332			1490		521	1822		457	1806	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	114	2	13	24	2	10	4	849	17	9	730	70
RTOR Reduction (vph)	0	8	0	0	8	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	121	0	0	28	0	4	865	0	9	796	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		9.3			9.3		42.8	42.8		42.8	42.8	
Effective Green, g (s)		9.3			9.3		42.8	42.8		42.8	42.8	
Actuated g/C Ratio		0.15			0.15		0.71	0.71		0.71	0.71	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		206			230		371	1297		325	1286	
v/s Ratio Prot								c0.47			0.44	
v/s Ratio Perm		c0.09			0.02		0.01			0.02		
v/c Ratio		0.59			0.12		0.01	0.67		0.03	0.62	
Uniform Delay, d1		23.6			21.9		2.5	4.7		2.5	4.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		4.3			0.2		0.1	2.7		0.2	2.2	
Delay (s)		27.9			22.1		2.6	7.5		2.7	6.7	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		27.9			22.1			7.5			6.7	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.65			
Actuated Cycle Length (s)	60.1	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	56.2%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/27/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	753	507	177	739	810
Future Volume (vph)	0	753	507	177	739	810
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	827	557	195	812	890
RTOR Reduction (vph)	0	0	0	0	0	214
Lane Group Flow (vph)	0	827	557	195	812	676
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		38.4	38.4	73.8	27.4	27.4
Effective Green, g (s)		38.4	38.4	73.8	27.4	27.4
Actuated g/C Ratio		0.52	0.52	1.00	0.37	0.37
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1772	1841	1524	1226	995
v/s Ratio Prot		c0.24	0.16			
v/s Ratio Perm				0.13	0.25	c0.25
v/c Ratio		0.47	0.30	0.13	0.66	0.68
Uniform Delay, d1		11.2	10.1	0.0	19.3	19.5
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.9	0.4	0.2	1.4	1.9
Delay (s)		12.1	10.5	0.2	20.7	21.4
Level of Service		B	B	A	C	C
Approach Delay (s)		12.1	7.8		21.0	
Approach LOS		B	A		C	

Intersection Summary				
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.55			
Actuated Cycle Length (s)	73.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	49.0%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/27/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1132	556	329	421	518
Future Volume (vph)	0	1132	556	329	421	518
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1167	573	339	434	534
RTOR Reduction (vph)	0	0	0	0	0	443
Lane Group Flow (vph)	0	1167	573	339	434	91
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		66.0	66.0	89.2	15.2	15.2
Effective Green, g (s)		66.0	66.0	89.2	15.2	15.2
Actuated g/C Ratio		0.74	0.74	1.00	0.17	0.17
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2520	2618	1524	562	457
v/s Ratio Prot		c0.34	0.16			
v/s Ratio Perm				0.22	c0.13	0.03
v/c Ratio		0.46	0.22	0.22	0.77	0.20
Uniform Delay, d1		4.6	3.6	0.0	35.3	31.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.6	0.2	0.3	6.5	0.2
Delay (s)		5.2	3.8	0.3	41.9	32.0
Level of Service		A	A	A	D	C
Approach Delay (s)		5.2	2.5		36.4	
Approach LOS		A	A		D	

Intersection Summary				
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	89.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	50.0%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1028	343	0	955	113	391
Future Volume (vph)	1028	343	0	955	113	391
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1094	365	0	1016	120	416
RTOR Reduction (vph)	0	0	0	0	0	100
Lane Group Flow (vph)	1094	365	0	1016	120	316
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	48.1	69.3		48.1	13.2	13.2
Effective Green, g (s)	48.1	69.3		48.1	13.2	13.2
Actuated g/C Ratio	0.69	1.00		0.69	0.19	0.19
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2364	1583		2364	629	510
v/s Ratio Prot	c0.32			0.30		
v/s Ratio Perm		0.23			0.04	c0.12
v/c Ratio	0.46	0.23		0.43	0.19	0.62
Uniform Delay, d1	4.8	0.0		4.6	23.6	25.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.3		0.6	0.1	2.2
Delay (s)	5.4	0.3		5.2	23.7	28.0
Level of Service	A	A		A	C	C
Approach Delay (s)	4.2			5.2	27.0	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	69.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.8%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	848	579	0	1452	83	258
Future Volume (vph)	848	579	0	1452	83	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	883	603	0	1512	86	269
RTOR Reduction (vph)	0	0	0	0	0	242
Lane Group Flow (vph)	883	603	0	1513	86	27
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	58.4	73.8		58.4	7.4	7.4
Effective Green, g (s)	58.4	73.8		58.4	7.4	7.4
Actuated g/C Ratio	0.79	1.00		0.79	0.10	0.10
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2695	1583		2695	331	268
v/s Ratio Prot	0.26			c0.44		
v/s Ratio Perm		c0.38			0.03	0.01
v/c Ratio	0.33	0.38		0.56	0.26	0.10
Uniform Delay, d1	2.2	0.0		2.9	30.7	30.2
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	0.7		0.9	0.4	0.2
Delay (s)	2.5	0.7		3.7	31.1	30.3
Level of Service	A	A		A	C	C
Approach Delay (s)	1.8			3.7	30.5	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.56			
Actuated Cycle Length (s)	73.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	50.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	8	0	38	2	183	0	499	57	187	740	1
Future Volume (vph)	4	8	0	38	2	183	0	499	57	187	740	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98			1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		1.00			0.89			0.98		1.00	1.00	
Flt Protected		0.98			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1830			1602			3414		1770	3471	
Flt Permitted		0.87			0.94			1.00		0.95	1.00	
Satd. Flow (perm)		1629			1525			3414		1770	3471	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	5	9	0	43	2	208	0	567	65	212	841	1
RTOR Reduction (vph)	0	0	0	0	174	0	0	9	0	0	0	0
Lane Group Flow (vph)	0	14	0	0	79	0	0	623	0	213	842	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		10.6			10.6			30.1		10.8	44.9	
Effective Green, g (s)		10.6			10.6			30.6		10.8	45.4	
Actuated g/C Ratio		0.17			0.17			0.48		0.17	0.71	
Clearance Time (s)		4.0			4.0			4.5		4.0	4.5	
Vehicle Extension (s)		4.0			4.0			4.0		1.0	4.0	
Lane Grp Cap (vph)		269			252			1632		298	2462	
v/s Ratio Prot								c0.18		c0.12	0.24	
v/s Ratio Perm		0.01			c0.05							
v/c Ratio		0.05			0.32			0.38		0.71	0.34	
Uniform Delay, d1		22.5			23.5			10.7		25.1	3.6	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.1			1.0			0.7		6.6	0.1	
Delay (s)		22.6			24.5			11.3		31.8	3.7	
Level of Service		C			C			B		C	A	
Approach Delay (s)		22.6			24.5			11.3			9.4	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	64.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	51.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	5	1	69	8	274	2	815	43	187	679	1
Future Volume (vph)	2	5	1	69	8	274	2	815	43	187	679	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.89		1.00	0.99		1.00	1.00	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1802			1615		1770	3443		1770	3470	
Flt Permitted		0.93			0.93		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1703			1524		1770	3443		1770	3470	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	2	5	1	71	8	282	2	840	44	193	700	1
RTOR Reduction (vph)	0	1	0	0	145	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	7	0	0	216	0	2	880	0	193	701	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		13.1			13.1		0.7	26.1		10.6	36.0	
Effective Green, g (s)		13.1			13.1		0.7	26.6		10.6	36.5	
Actuated g/C Ratio		0.21			0.21		0.01	0.43		0.17	0.59	
Clearance Time (s)		4.0			4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)		2.0			2.0		2.0	4.0		1.0	4.0	
Lane Grp Cap (vph)		358			320		19	1470		301	2032	
v/s Ratio Prot							0.00	c0.26		c0.11	0.20	
v/s Ratio Perm		0.00			c0.14							
v/c Ratio		0.02			0.67		0.11	0.60		0.64	0.34	
Uniform Delay, d1		19.5			22.6		30.5	13.7		24.1	6.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			4.4		0.9	0.8		3.5	0.1	
Delay (s)		19.5			27.0		31.4	14.5		27.6	6.8	
Level of Service		B			C		C	B		C	A	
Approach Delay (s)		19.5			27.0			14.6			11.3	
Approach LOS		B			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	62.3	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	70.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	83	0	18	0	0	0	8	514	0	0	783	95
Future Volume (Veh/h)	83	0	18	0	0	0	8	514	0	0	783	95
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	92	0	20	0	0	0	9	571	0	0	870	106
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.90	0.90		0.90	0.90	0.90				0.90		
vC, conflicting volume	1512	1512	923	1532	1565	571	976			571		
vC1, stage 1 conf vol	923	923		589	589							
vC2, stage 2 conf vol	589	589		943	976							
vCu, unblocked vol	1513	1513	923	1536	1572	466	976			466		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	67	100	94	100	100	100	99			100		
cM capacity (veh/h)	276	294	327	252	276	536	707			984		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	112	0	580	976
Volume Left	92	0	9	0
Volume Right	20	0	0	106
cSH	284	1700	707	984
Volume to Capacity	0.39	0.00	0.01	0.00
Queue Length 95th (ft)	45	0	1	0
Control Delay (s)	25.7	0.0	0.3	0.0
Lane LOS	D	A	A	
Approach Delay (s)	25.7	0.0	0.3	0.0
Approach LOS	D	A		

Intersection Summary					
Average Delay		1.8			
Intersection Capacity Utilization	59.3%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	0	12	0	0	0	4	811	0	0	691	63
Future Volume (Veh/h)	103	0	12	0	0	0	4	811	0	0	691	63
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	114	0	13	0	0	0	4	901	0	0	768	70
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.84	0.84		0.84	0.84	0.84				0.84		
vC, conflicting volume	1712	1712	803	1725	1747	901	838			901		
vC1, stage 1 conf vol	803	803		909	909							
vC2, stage 2 conf vol	909	909		816	838							
vCu, unblocked vol	1754	1754	803	1769	1796	783	838			783		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	53	100	97	100	100	100	99			100		
cM capacity (veh/h)	242	257	383	235	251	329	796			698		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	127	0	905	838
Volume Left	114	0	4	0
Volume Right	13	0	0	70
cSH	251	1700	796	698
Volume to Capacity	0.51	0.00	0.01	0.00
Queue Length 95th (ft)	66	0	0	0
Control Delay (s)	33.2	0.0	0.1	0.0
Lane LOS	D	A	A	
Approach Delay (s)	33.2	0.0	0.1	0.0
Approach LOS	D	A		

Intersection Summary					
Average Delay		2.3			
Intersection Capacity Utilization	59.0%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	222	639	86	137	601	41	37	271	175	55	349	315
Future Volume (vph)	222	639	86	137	601	41	37	271	175	55	349	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3404		1770	3435		1770	1644	1563	1770	1644	1563
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3404		1770	3435		1770	1644	1563	1770	1644	1563
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	247	710	96	152	668	46	41	301	194	61	388	350
RTOR Reduction (vph)	0	10	0	0	5	0	0	0	61	0	0	65
Lane Group Flow (vph)	247	796	0	152	709	0	41	301	133	61	388	285
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Parking (#/hr)								0			0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	15.3	35.5		10.7	30.9		3.6	26.9	37.6	4.9	28.2	43.5
Effective Green, g (s)	15.3	35.5		10.7	30.9		3.6	26.9	37.6	4.9	28.2	43.5
Actuated g/C Ratio	0.16	0.38		0.11	0.33		0.04	0.29	0.40	0.05	0.30	0.46
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	288	1285		201	1129		67	470	691	92	493	789
v/s Ratio Prot	c0.14	c0.23		0.09	0.21		0.02	0.18	0.02	c0.03	c0.24	0.06
v/s Ratio Perm									0.06			0.12
v/c Ratio	0.86	0.62		0.76	0.63		0.61	0.64	0.19	0.66	0.79	0.36
Uniform Delay, d1	38.3	23.8		40.4	26.7		44.5	29.3	18.3	43.7	30.1	16.3
Progression Factor	1.00	1.00		1.00	1.37		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.8	2.3		13.0	2.6		11.1	3.3	0.0	13.0	8.6	0.1
Delay (s)	59.0	26.0		53.3	39.1		55.6	32.6	18.4	56.8	38.7	16.4
Level of Service	E	C		D	D		E	C	B	E	D	B
Approach Delay (s)		33.8			41.6			29.2			30.3	
Approach LOS		C			D			C			C	

Intersection Summary				
HCM 2000 Control Delay	34.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	70.7%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	307	660	59	214	527	104	55	332	240	124	348	330
Future Volume (vph)	307	660	59	214	527	104	55	332	240	124	348	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3423		1770	3379		1770	1827	1564	1770	1827	1563
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3423		1770	3379		1770	1827	1564	1770	1827	1563
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	310	667	60	216	532	105	56	335	242	125	352	333
RTOR Reduction (vph)	0	5	0	0	13	0	0	0	65	0	0	77
Lane Group Flow (vph)	310	722	0	216	624	0	56	335	177	125	352	256
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	24.2	47.2		17.6	40.6		6.6	27.7	45.3	11.5	32.6	56.8
Effective Green, g (s)	24.2	47.2		17.6	40.6		6.6	27.7	45.3	11.5	32.6	56.8
Actuated g/C Ratio	0.20	0.39		0.15	0.34		0.05	0.23	0.38	0.10	0.27	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	356	1346		259	1143		97	421	642	169	496	791
v/s Ratio Prot	c0.18	c0.21		0.12	0.18		0.03	c0.18	0.04	c0.07	0.19	0.07
v/s Ratio Perm									0.07			0.10
v/c Ratio	0.87	0.54		0.83	0.55		0.58	0.80	0.28	0.74	0.71	0.32
Uniform Delay, d1	46.4	28.0		49.8	32.2		55.3	43.5	25.9	52.8	39.4	19.6
Progression Factor	1.00	1.00		1.24	0.46		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.5	1.5		18.4	1.8		5.1	10.5	0.1	13.6	5.0	0.1
Delay (s)	65.9	29.5		80.0	16.7		60.4	54.0	26.0	66.4	44.4	19.7
Level of Service	E	C		E	B		E	D	C	E	D	B
Approach Delay (s)		40.4			32.7			43.9			37.6	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	38.4	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	78.1%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	866	4	5	777	2	0	0	0	0	0	1
Future Volume (Veh/h)	0	866	4	5	777	2	0	0	0	0	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	902	4	5	809	2	0	0	0	0	0	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked				0.82			0.82	0.82	0.82	0.82	0.82	
vC, conflicting volume	811			906			1320	1725	453	1271	1726	406
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	811			450			954	1448	0	895	1449	406
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	100	100	100	100
cM capacity (veh/h)	811			909			174	106	891	193	106	595

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	451	455	5	539	272	1
Volume Left	0	0	5	0	0	0
Volume Right	0	4	0	0	2	1
cSH	811	1700	909	1700	1700	595
Volume to Capacity	0.00	0.27	0.01	0.32	0.16	0.00
Queue Length 95th (ft)	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	9.0	0.0	0.0	11.1
Lane LOS			A			B
Approach Delay (s)	0.0		0.1			11.1
Approach LOS						B

Intersection Summary					
Average Delay	0.0				
Intersection Capacity Utilization	34.1%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	996	23	14	823	23	0	0	0	0	0	22
Future Volume (Veh/h)	5	996	23	14	823	23	0	0	0	0	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	5	1038	24	15	857	24	0	0	0	0	0	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.92			0.84			0.88	0.88	0.84	0.88	0.88	0.92
vC, conflicting volume	881			1062			1542	1971	531	1428	1971	440
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	707			699			955	1443	69	826	1443	230
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	100	100	100	100	97
cM capacity (veh/h)	820			752			178	112	825	228	112	714

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	524	543	15	571	310	23
Volume Left	5	0	15	0	0	0
Volume Right	0	24	0	0	24	23
cSH	820	1700	752	1700	1700	714
Volume to Capacity	0.01	0.32	0.02	0.34	0.18	0.03
Queue Length 95th (ft)	0	0	2	0	0	2
Control Delay (s)	0.2	0.0	9.9	0.0	0.0	10.2
Lane LOS	A		A			B
Approach Delay (s)	0.1		0.2			10.2
Approach LOS						B

Intersection Summary					
Average Delay	0.2				
Intersection Capacity Utilization	41.8%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	740	177	185	765	27	196	116	163	48	129	42
Future Volume (vph)	27	740	177	185	765	27	196	116	163	48	129	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.91			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3350		1770	3452		1770	1653			1767	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3350		1770	3452		1770	1653			1767	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	29	787	188	197	814	29	209	123	173	51	137	45
RTOR Reduction (vph)	0	21	0	0	2	0	0	64	0	0	0	0
Lane Group Flow (vph)	29	954	0	197	841	0	209	232	0	0	233	0
Confl. Peds. (#/hr)	1		7	7		1			2	2		
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	5.9	33.5		12.9	40.5		14.3	14.3			17.3	
Effective Green, g (s)	5.9	33.5		12.9	40.5		14.3	14.3			17.3	
Actuated g/C Ratio	0.06	0.36		0.14	0.43		0.15	0.15			0.18	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	111	1193		242	1487		269	251			325	
v/s Ratio Prot	0.02	c0.28		c0.11	0.24		0.12	c0.14			c0.13	
v/s Ratio Perm												
v/c Ratio	0.26	0.80		0.81	0.57		0.78	0.93			0.72	
Uniform Delay, d1	42.0	27.2		39.4	20.1		38.3	39.3			36.0	
Progression Factor	0.91	0.88		1.19	1.78		1.00	1.00			1.00	
Incremental Delay, d2	0.4	5.3		13.5	1.1		12.7	37.0			6.9	
Delay (s)	38.7	29.3		60.4	36.9		51.0	76.4			42.9	
Level of Service	D	C		E	D		D	E			D	
Approach Delay (s)		29.6			41.4			65.9			42.9	
Approach LOS		C			D			E			D	

Intersection Summary				
HCM 2000 Control Delay	41.7	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.81			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	78.7%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	911	216	183	758	42	232	152	202	82	98	63
Future Volume (vph)	62	911	216	183	758	42	232	152	202	82	98	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	0.97			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.91			0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1770	3314		1770	3438		1770	1636			1735	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (perm)	1770	3314		1770	3438		1770	1636			1735	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	66	969	230	195	806	45	247	162	215	87	104	67
RTOR Reduction (vph)	0	18	0	0	3	0	0	41	0	0	0	0
Lane Group Flow (vph)	66	1181	0	195	848	0	247	336	0	0	258	0
Confl. Peds. (#/hr)	7		32	32		7	18		28	28		18
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	5.3	35.8		13.1	43.6		28.9	28.9			26.2	
Effective Green, g (s)	5.3	35.8		13.1	43.6		28.9	28.9			26.2	
Actuated g/C Ratio	0.04	0.30		0.11	0.36		0.24	0.24			0.22	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	78	988		193	1249		426	394			378	
v/s Ratio Prot	0.04	c0.36		c0.11	0.25		0.14	c0.21			c0.15	
v/s Ratio Perm												
v/c Ratio	0.85	1.20		1.01	0.68		0.58	0.85			0.68	
Uniform Delay, d1	56.9	42.1		53.5	32.3		40.2	43.5			43.1	
Progression Factor	0.66	0.69		1.08	0.25		1.00	1.00			1.00	
Incremental Delay, d2	47.7	97.1		36.6	0.8		1.6	16.0			4.6	
Delay (s)	85.2	126.3		94.2	8.8		41.8	59.5			47.7	
Level of Service	F	F		F	A		D	E			D	
Approach Delay (s)		124.2			24.7			52.5			47.7	
Approach LOS		F			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	71.4	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	98.9%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1363	195	505	1058	0	0	0	0	286	0	426
Future Volume (vph)	0	1363	195	505	1058	0	0	0	0	286	0	426
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1482	212	549	1150	0	0	0	0	311	0	463
RTOR Reduction (vph)	0	0	52	0	0	0	0	0	0	0	0	90
Lane Group Flow (vph)	0	1482	160	549	1150	0	0	0	0	0	311	373
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		44.0	44.0	16.0	64.0						22.0	22.0
Effective Green, g (s)		44.0	44.0	16.0	64.0						22.0	22.0
Actuated g/C Ratio		0.47	0.47	0.17	0.68						0.23	0.23
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1656	726	573	2409						406	363
v/s Ratio Prot		c0.42	0.10	c0.16	0.32							
v/s Ratio Perm											0.18	c0.24
v/c Ratio		0.89	0.22	0.96	0.48						0.77	1.03
Uniform Delay, d1		22.9	14.8	38.7	7.1						33.6	36.0
Progression Factor		0.84	0.46	0.98	0.75						1.00	1.00
Incremental Delay, d2		7.5	0.7	26.3	0.6						8.4	54.8
Delay (s)		26.8	7.5	64.1	5.9						42.0	90.8
Level of Service		C	A	E	A						D	F
Approach Delay (s)		24.4			24.7			0.0			71.2	
Approach LOS		C			C			A			E	

Intersection Summary				
HCM 2000 Control Delay	33.2	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.94			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	77.9%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1618	143	430	1393	0	0	0	0	408	1	418
Future Volume (vph)	0	1618	143	430	1393	0	0	0	0	408	1	418
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1740	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1740	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1759	155	467	1514	0	0	0	0	443	1	454
RTOR Reduction (vph)	0	0	25	0	0	0	0	0	0	0	0	44
Lane Group Flow (vph)	0	1759	130	467	1514	0	0	0	0	0	444	410
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Perm	Prot	NA					Prot	NA	Perm
Protected Phases		4		3	8					1	6	
Permitted Phases			4									6
Actuated Green, G (s)		62.0	62.0	17.0	83.0						29.0	29.0
Effective Green, g (s)		62.0	62.0	17.0	83.0						29.0	29.0
Actuated g/C Ratio		0.52	0.52	0.14	0.69						0.24	0.24
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1828	802	476	2447						420	375
v/s Ratio Prot		c0.50		c0.14	0.43							
v/s Ratio Perm			0.08								0.26	c0.26
v/c Ratio		0.96	0.16	0.98	0.62						1.06	1.09
Uniform Delay, d1		27.9	15.3	51.3	10.0						45.5	45.5
Progression Factor		0.62	0.77	0.89	1.07						1.00	1.00
Incremental Delay, d2		12.2	0.4	34.6	1.1						59.8	74.0
Delay (s)		29.4	12.1	80.1	11.8						105.3	119.5
Level of Service		C	B	F	B						F	F
Approach Delay (s)		28.0			27.9			0.0			112.5	
Approach LOS		C			C			A			F	

Intersection Summary				
HCM 2000 Control Delay	43.8	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	1.00			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	89.6%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1201	482	0	1642	143	319
Future Volume (vph)	1201	482	0	1642	143	319
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1264	507	0	1728	151	336
RTOR Reduction (vph)	0	106	0	0	0	149
Lane Group Flow (vph)	1264	401	0	1728	151	187
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	74.3	74.3		74.3	11.7	11.7
Effective Green, g (s)	74.3	74.3		74.3	11.7	11.7
Actuated g/C Ratio	0.79	0.79		0.79	0.12	0.12
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2797	1251		3665	419	340
v/s Ratio Prot	0.36			c0.37		
v/s Ratio Perm		0.25			0.04	c0.07
v/c Ratio	0.45	0.32		0.47	0.36	0.55
Uniform Delay, d1	3.2	2.8		3.3	37.7	38.7
Progression Factor	0.45	0.22		1.83	1.00	1.00
Incremental Delay, d2	0.4	0.5		0.4	0.5	1.9
Delay (s)	1.9	1.1		6.4	38.3	40.6
Level of Service	A	A		A	D	D
Approach Delay (s)	1.7			6.4	39.9	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.48			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	51.0%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1606	426	0	1937	186	572
Future Volume (vph)	1606	426	0	1937	186	572
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1691	448	0	2039	196	602
RTOR Reduction (vph)	0	103	0	0	0	41
Lane Group Flow (vph)	1691	345	0	2039	196	561
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	82.4	82.4		82.4	29.6	29.6
Effective Green, g (s)	82.4	82.4		82.4	29.6	29.6
Actuated g/C Ratio	0.69	0.69		0.69	0.25	0.25
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2430	1086		3184	830	674
v/s Ratio Prot	c0.48			0.44		
v/s Ratio Perm		0.22			0.06	c0.21
v/c Ratio	0.70	0.32		0.64	0.24	0.83
Uniform Delay, d1	11.3	7.5		10.5	36.2	42.9
Progression Factor	0.24	0.00		1.07	1.00	1.00
Incremental Delay, d2	1.3	0.6		0.8	0.1	8.7
Delay (s)	4.0	0.6		12.1	36.3	51.5
Level of Service	A	A		B	D	D
Approach Delay (s)	3.3			12.1	47.8	
Approach LOS	A			B	D	

Intersection Summary				
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	71.1%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St 9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	0	18	0	0	0	8	514	0	0	783	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0					4.0	4.0			4.0	
Lane Util. Factor		1.00					1.00	1.00			1.00	
Frt		0.98					1.00	1.00			0.98	
Flt Protected		0.96					0.95	1.00			1.00	
Satd. Flow (prot)		1746					1770	1827			1801	
Flt Permitted		0.76					0.20	1.00			1.00	
Satd. Flow (perm)		1388					370	1827			1801	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	92	0	20	0	0	0	9	571	0	0	870	106
RTOR Reduction (vph)	0	16	0	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	96	0	0	0	0	9	571	0	0	971	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA					Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.7					41.0	41.0			41.0	
Effective Green, g (s)		7.7					41.0	41.0			41.0	
Actuated g/C Ratio		0.14					0.72	0.72			0.72	
Clearance Time (s)		4.0					4.0	4.0			4.0	
Vehicle Extension (s)		3.0					3.0	3.0			3.0	
Lane Grp Cap (vph)		188					267	1321			1302	
v/s Ratio Prot								0.31			c0.54	
v/s Ratio Perm		c0.07					0.02					
v/c Ratio		0.51					0.03	0.43			0.75	
Uniform Delay, d1		22.8					2.2	3.2			4.7	
Progression Factor		1.00					1.00	1.00			1.00	
Incremental Delay, d2		2.4					0.1	0.2			2.4	
Delay (s)		25.1					2.3	3.4			7.1	
Level of Service		C					A	A			A	
Approach Delay (s)		25.1			0.0			3.4			7.1	
Approach LOS		C			A			A			A	

Intersection Summary				
HCM 2000 Control Delay	7.0	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	56.7	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	59.3%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St 9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	0	12	0	0	0	4	811	0	0	691	63
Future Volume (vph)	103	0	12	0	0	0	4	811	0	0	691	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0					4.0	4.0			4.0	
Lane Util. Factor		1.00					1.00	1.00			1.00	
Frt		0.99					1.00	1.00			0.99	
Flt Protected		0.96					0.95	1.00			1.00	
Satd. Flow (prot)		1758					1770	1827			1807	
Flt Permitted		0.75					0.26	1.00			1.00	
Satd. Flow (perm)		1373					476	1827			1807	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	114	0	13	0	0	0	4	901	0	0	768	70
RTOR Reduction (vph)	0	15	0	0	0	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	112	0	0	0	0	4	901	0	0	834	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA					Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.1					37.0	37.0			37.0	
Effective Green, g (s)		8.1					37.0	37.0			37.0	
Actuated g/C Ratio		0.15					0.70	0.70			0.70	
Clearance Time (s)		4.0					4.0	4.0			4.0	
Vehicle Extension (s)		3.0					3.0	3.0			3.0	
Lane Grp Cap (vph)		209					331	1273			1259	
v/s Ratio Prot								c0.49			0.46	
v/s Ratio Perm		c0.08					0.01					
v/c Ratio		0.53					0.01	0.71			0.66	
Uniform Delay, d1		20.8					2.5	4.8			4.5	
Progression Factor		1.00					1.00	1.00			1.00	
Incremental Delay, d2		2.6					0.0	1.8			1.3	
Delay (s)		23.4					2.5	6.6			5.9	
Level of Service		C					A	A			A	
Approach Delay (s)		23.4			0.0			6.6			5.9	
Approach LOS		C			A			A			A	

Intersection Summary				
HCM 2000 Control Delay	7.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	53.1	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	55.8%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps 9/28/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	763	509	177	739	812
Future Volume (vph)	0	763	509	177	739	812
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	838	559	195	812	892
RTOR Reduction (vph)	0	0	0	0	0	213
Lane Group Flow (vph)	0	838	559	195	812	679
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		38.4	38.4	73.9	27.5	27.5
Effective Green, g (s)		38.4	38.4	73.9	27.5	27.5
Actuated g/C Ratio		0.52	0.52	1.00	0.37	0.37
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1769	1838	1524	1229	998
v/s Ratio Prot		c0.25	0.16			
v/s Ratio Perm				0.13	0.25	c0.25
v/c Ratio		0.47	0.30	0.13	0.66	0.68
Uniform Delay, d1		11.3	10.1	0.0	19.3	19.5
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.9	0.4	0.2	1.3	1.9
Delay (s)		12.2	10.6	0.2	20.7	21.4
Level of Service		B	B	A	C	C
Approach Delay (s)		12.2	7.9		21.1	
Approach LOS		B	A		C	

Intersection Summary				
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.56			
Actuated Cycle Length (s)	73.9	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	49.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps 9/28/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1141	560	329	421	521
Future Volume (vph)	0	1141	560	329	421	521
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1176	577	339	434	537
RTOR Reduction (vph)	0	0	0	0	0	445
Lane Group Flow (vph)	0	1176	577	339	434	92
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		66.0	66.0	89.2	15.2	15.2
Effective Green, g (s)		66.0	66.0	89.2	15.2	15.2
Actuated g/C Ratio		0.74	0.74	1.00	0.17	0.17
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2520	2618	1524	562	457
v/s Ratio Prot		c0.35	0.16			
v/s Ratio Perm				0.22	c0.13	0.03
v/c Ratio		0.47	0.22	0.22	0.77	0.20
Uniform Delay, d1		4.6	3.6	0.0	35.3	31.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.6	0.2	0.3	6.5	0.2
Delay (s)		5.2	3.8	0.3	41.9	32.0
Level of Service		A	A	A	D	C
Approach Delay (s)		5.2	2.5		36.4	
Approach LOS		A	A		D	

Intersection Summary				
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	89.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	50.2%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1032	349	0	957	113	391
Future Volume (vph)	1032	349	0	957	113	391
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1098	371	0	1018	120	416
RTOR Reduction (vph)	0	0	0	0	0	100
Lane Group Flow (vph)	1098	371	0	1018	120	316
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	48.1	69.3		48.1	13.2	13.2
Effective Green, g (s)	48.1	69.3		48.1	13.2	13.2
Actuated g/C Ratio	0.69	1.00		0.69	0.19	0.19
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2364	1583		2364	629	510
v/s Ratio Prot	c0.32			0.30		
v/s Ratio Perm		0.23			0.04	c0.12
v/c Ratio	0.46	0.23		0.43	0.19	0.62
Uniform Delay, d1	4.8	0.0		4.6	23.6	25.8
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.3		0.6	0.1	2.3
Delay (s)	5.4	0.3		5.2	23.7	28.1
Level of Service	A	A		A	C	C
Approach Delay (s)	4.2			5.2	27.1	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	69.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	852	585	0	1457	83	258
Future Volume (vph)	852	585	0	1457	83	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	888	609	0	1518	86	269
RTOR Reduction (vph)	0	0	0	0	0	242
Lane Group Flow (vph)	888	609	0	1518	86	27
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	58.4	73.8		58.4	7.4	7.4
Effective Green, g (s)	58.4	73.8		58.4	7.4	7.4
Actuated g/C Ratio	0.79	1.00		0.79	0.10	0.10
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2695	1583		2695	331	268
v/s Ratio Prot	0.26			c0.45		
v/s Ratio Perm		c0.38			0.03	0.01
v/c Ratio	0.33	0.38		0.56	0.26	0.10
Uniform Delay, d1	2.2	0.0		2.9	30.7	30.2
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	0.7		0.9	0.4	0.2
Delay (s)	2.5	0.7		3.8	31.1	30.3
Level of Service	A	A		A	C	C
Approach Delay (s)	1.8			3.8	30.5	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	73.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	50.3%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	8	0	38	2	183	0	509	57	187	743	1
Future Volume (vph)	4	8	0	38	2	183	0	509	57	187	743	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98			1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		1.00			0.89			0.98		1.00	1.00	
Flt Protected		0.98			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1830			1602			3415		1770	3471	
Flt Permitted		0.87			0.94			1.00		0.95	1.00	
Satd. Flow (perm)		1629			1525			3415		1770	3471	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	5	9	0	43	2	208	0	578	65	212	844	1
RTOR Reduction (vph)	0	0	0	0	174	0	0	9	0	0	0	0
Lane Group Flow (vph)	0	14	0	0	79	0	0	634	0	213	845	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		10.6			10.6			30.1		10.8	44.9	
Effective Green, g (s)		10.6			10.6			30.6		10.8	45.4	
Actuated g/C Ratio		0.17			0.17			0.48		0.17	0.71	
Clearance Time (s)		4.0			4.0			4.5		4.0	4.5	
Vehicle Extension (s)		4.0			4.0			4.0		1.0	4.0	
Lane Grp Cap (vph)		269			252			1632		298	2462	
v/s Ratio Prot								c0.19		c0.12	0.24	
v/s Ratio Perm		0.01			c0.05							
v/c Ratio		0.05			0.32			0.39		0.71	0.34	
Uniform Delay, d1		22.5			23.5			10.7		25.1	3.6	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.1			1.0			0.7		6.6	0.1	
Delay (s)		22.6			24.5			11.4		31.8	3.7	
Level of Service		C			C			B		C	A	
Approach Delay (s)		22.6			24.5			11.4			9.3	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	64.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	51.4%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	5	1	69	8	274	2	824	43	187	687	1
Future Volume (vph)	2	5	1	69	8	274	2	824	43	187	687	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.89		1.00	0.99		1.00	1.00	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1802			1615		1770	3444		1770	3470	
Flt Permitted		0.93			0.93		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1701			1524		1770	3444		1770	3470	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	2	5	1	71	8	282	2	849	44	193	708	1
RTOR Reduction (vph)	0	1	0	0	145	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	7	0	0	216	0	2	889	0	193	709	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		13.1			13.1		0.7	26.3		10.6	36.2	
Effective Green, g (s)		13.1			13.1		0.7	26.8		10.6	36.7	
Actuated g/C Ratio		0.21			0.21		0.01	0.43		0.17	0.59	
Clearance Time (s)		4.0			4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)		2.0			2.0		2.0	4.0		1.0	4.0	
Lane Grp Cap (vph)		356			319		19	1476		300	2037	
v/s Ratio Prot							0.00	c0.26		c0.11	0.20	
v/s Ratio Perm		0.00			c0.14							
v/c Ratio		0.02			0.68		0.11	0.60		0.64	0.35	
Uniform Delay, d1		19.6			22.7		30.6	13.7		24.2	6.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			4.4		0.9	0.8		3.5	0.1	
Delay (s)		19.6			27.2		31.5	14.6		27.7	6.8	
Level of Service		B			C		C	B		C	A	
Approach Delay (s)		19.6			27.2			14.6			11.3	
Approach LOS		B			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	62.5	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	70.8%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	83	1	18	28	2	10	8	514	16	4	783	95
Future Volume (Veh/h)	83	1	18	28	2	10	8	514	16	4	783	95
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	92	1	20	31	2	11	9	571	18	4	870	106
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.90	0.90		0.90	0.90	0.90				0.90		
vC, conflicting volume	1532	1538	923	1496	1582	580	976			589		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1536	1542	923	1496	1591	477	976			487		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	99	94	63	98	98	99			100		
cM capacity (veh/h)	81	102	327	84	95	529	707			968		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	113	44	9	589	4	976
Volume Left	92	31	9	0	4	0
Volume Right	20	11	0	18	0	106
cSH	94	107	707	1700	968	1700
Volume to Capacity	1.21	0.41	0.01	0.35	0.00	0.57
Queue Length 95th (ft)	196	43	1	0	0	0
Control Delay (s)	241.3	60.7	10.2	0.0	8.7	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	241.3	60.7	0.2		0.0	
Approach LOS	F	F				

Intersection Summary					
Average Delay	17.3				
Intersection Capacity Utilization	60.6%	ICU Level of Service	B		
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	2	12	26	2	9	4	811	36	8	691	63
Future Volume (Veh/h)	103	2	12	26	2	9	4	811	36	8	691	63
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	114	2	13	29	2	10	4	901	40	9	768	70
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.83	0.83		0.83	0.83	0.83				0.83		
vC, conflicting volume	1741	1770	803	1729	1785	921	838			941		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1790	1825	803	1776	1843	803	838			827		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	97	97	42	97	97	99			99		
cM capacity (veh/h)	49	63	383	50	61	319	796			668		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	129	41	4	941	9	838
Volume Left	114	29	4	0	9	0
Volume Right	13	10	0	40	0	70
cSH	53	63	796	1700	668	1700
Volume to Capacity	2.41	0.65	0.01	0.55	0.01	0.49
Queue Length 95th (ft)	328	69	0	0	1	0
Control Delay (s)	807.4	134.0	9.5	0.0	10.5	0.0
Lane LOS	F	F	A		B	
Approach Delay (s)	807.4	134.0	0.0		0.1	
Approach LOS	F	F				

Intersection Summary					
Average Delay	56.0				
Intersection Capacity Utilization	59.6%	ICU Level of Service	B		
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	223	639	86	137	601	52	37	275	175	73	357	317
Future Volume (vph)	223	639	86	137	601	52	37	275	175	73	357	317
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3404		1770	3427		1770	1644	1563	1770	1644	1562
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3404		1770	3427		1770	1644	1563	1770	1644	1562
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	248	710	96	152	668	58	41	306	194	81	397	352
RTOR Reduction (vph)	0	10	0	0	6	0	0	0	48	0	0	64
Lane Group Flow (vph)	248	796	0	152	720	0	41	306	146	81	397	288
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Parking (#/hr)								0			0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	15.2	35.0		10.7	30.5		3.6	27.1	37.8	5.2	28.7	43.9
Effective Green, g (s)	15.2	35.0		10.7	30.5		3.6	27.1	37.8	5.2	28.7	43.9
Actuated g/C Ratio	0.16	0.37		0.11	0.32		0.04	0.29	0.40	0.06	0.31	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	286	1267		201	1111		67	473	695	97	501	795
v/s Ratio Prot	c0.14	c0.23		0.09	0.21		0.02	0.19	0.02	c0.05	c0.24	0.06
v/s Ratio Perm									0.07			0.13
v/c Ratio	0.87	0.63		0.76	0.65		0.61	0.65	0.21	0.84	0.79	0.36
Uniform Delay, d1	38.4	24.2		40.4	27.2		44.5	29.3	18.4	44.0	29.9	16.1
Progression Factor	1.00	1.00		1.00	1.36		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	22.4	2.4		13.0	2.8		11.1	3.4	0.1	41.7	8.8	0.1
Delay (s)	60.8	26.5		53.3	39.7		55.6	32.7	18.4	85.7	38.8	16.2
Level of Service	E	C		D	D		E	C	B	F	D	B
Approach Delay (s)		34.6			42.0			29.3			33.8	
Approach LOS		C			D			C			C	

Intersection Summary				
HCM 2000 Control Delay	35.5	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	71.1%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	309	660	59	214	527	128	55	341	240	141	355	331
Future Volume (vph)	309	660	59	214	527	128	55	341	240	141	355	331
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3423		1770	3362		1770	1827	1564	1770	1827	1563
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3423		1770	3362		1770	1827	1564	1770	1827	1563
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	312	667	60	216	532	129	56	344	242	142	359	334
RTOR Reduction (vph)	0	5	0	0	16	0	0	0	60	0	0	76
Lane Group Flow (vph)	312	722	0	216	645	0	56	344	182	142	359	258
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	24.3	46.1		17.6	39.4		6.6	28.0	45.6	12.3	33.7	58.0
Effective Green, g (s)	24.3	46.1		17.6	39.4		6.6	28.0	45.6	12.3	33.7	58.0
Actuated g/C Ratio	0.20	0.38		0.15	0.33		0.05	0.23	0.38	0.10	0.28	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	358	1315		259	1103		97	426	646	181	513	807
v/s Ratio Prot	c0.18	0.21		0.12	c0.19		0.03	c0.19	0.04	c0.08	0.20	0.06
v/s Ratio Perm									0.08			0.10
v/c Ratio	0.87	0.55		0.83	0.58		0.58	0.81	0.28	0.78	0.70	0.32
Uniform Delay, d1	46.3	28.8		49.8	33.5		55.3	43.5	25.8	52.6	38.6	18.9
Progression Factor	1.00	1.00		1.26	0.46		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.5	1.7		18.4	2.1		5.1	11.3	0.1	18.3	4.5	0.1
Delay (s)	65.9	30.5		81.0	17.5		60.4	54.7	25.9	70.8	43.1	19.0
Level of Service	E	C		F	B		E	D	C	E	D	B
Approach Delay (s)		41.1			33.1			44.4			38.2	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	38.9	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	79.5%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	884	4	5	788	2	0	0	0	0	0	1
Future Volume (Veh/h)	0	884	4	5	788	2	0	0	0	0	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	921	4	5	821	2	0	0	0	0	0	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked				0.82			0.82	0.82	0.82	0.82	0.82	
vC, conflicting volume	823			925			1344	1756	462	1292	1757	412
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	823			468			980	1482	0	917	1483	412
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	100	100	100	100
cM capacity (veh/h)	803			893			166	101	889	185	101	589

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	460	464	5	547	276	1
Volume Left	0	0	5	0	0	0
Volume Right	0	4	0	0	2	1
cSH	803	1700	893	1700	1700	589
Volume to Capacity	0.00	0.27	0.01	0.32	0.16	0.00
Queue Length 95th (ft)	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	9.1	0.0	0.0	11.1
Lane LOS			A			B
Approach Delay (s)	0.0		0.1			11.1
Approach LOS						B

Intersection Summary					
Average Delay	0.0				
Intersection Capacity Utilization	34.6%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1013	23	14	848	23	0	0	0	0	0	22
Future Volume (Veh/h)	5	1013	23	14	848	23	0	0	0	0	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	5	1055	24	15	883	24	0	0	0	0	0	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.92			0.84			0.88	0.88	0.84	0.88	0.88	0.92
vC, conflicting volume	907			1079			1572	2014	540	1462	2014	454
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	718			713			956	1458	70	832	1458	223
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	100	100	100	100	97
cM capacity (veh/h)	806			742			178	110	821	226	110	715

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	532	552	15	589	318	23
Volume Left	5	0	15	0	0	0
Volume Right	0	24	0	0	24	23
cSH	806	1700	742	1700	1700	715
Volume to Capacity	0.01	0.32	0.02	0.35	0.19	0.03
Queue Length 95th (ft)	0	0	2	0	0	2
Control Delay (s)	0.2	0.0	10.0	0.0	0.0	10.2
Lane LOS	A		A			B
Approach Delay (s)	0.1		0.2			10.2
Approach LOS						B

Intersection Summary					
Average Delay	0.2				
Intersection Capacity Utilization	42.2%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	755	180	185	775	27	198	116	163	48	129	42
Future Volume (vph)	27	755	180	185	775	27	198	116	163	48	129	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.91			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3350		1770	3452		1770	1653			1767	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3350		1770	3452		1770	1653			1767	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	29	803	191	197	824	29	211	123	173	51	137	45
RTOR Reduction (vph)	0	21	0	0	2	0	0	64	0	0	0	0
Lane Group Flow (vph)	29	973	0	197	851	0	211	232	0	0	233	0
Confl. Peds. (#/hr)	1		7	7		1			2	2		
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	5.8	33.5		12.9	40.6		14.3	14.3			17.3	
Effective Green, g (s)	5.8	33.5		12.9	40.6		14.3	14.3			17.3	
Actuated g/C Ratio	0.06	0.36		0.14	0.43		0.15	0.15			0.18	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	109	1193		242	1490		269	251			325	
v/s Ratio Prot	0.02	c0.29		c0.11	0.25		0.12	c0.14			c0.13	
v/s Ratio Perm												
v/c Ratio	0.27	0.82		0.81	0.57		0.78	0.93			0.72	
Uniform Delay, d1	42.1	27.5		39.4	20.1		38.4	39.3			36.0	
Progression Factor	0.90	0.86		1.19	1.78		1.00	1.00			1.00	
Incremental Delay, d2	0.4	5.8		13.4	1.2		13.4	37.0			6.9	
Delay (s)	38.2	29.3		60.1	37.0		51.8	76.4			42.9	
Level of Service	D	C		E	D		D	E			D	
Approach Delay (s)		29.6			41.3			66.1			42.9	
Approach LOS		C			D			E			D	

Intersection Summary				
HCM 2000 Control Delay	41.6	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.81			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	79.2%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	925	219	183	779	42	235	152	202	82	98	63
Future Volume (vph)	62	925	219	183	779	42	235	152	202	82	98	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	0.97			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.91			0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1770	3314		1770	3439		1770	1636			1735	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (perm)	1770	3314		1770	3439		1770	1636			1735	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	66	984	233	195	829	45	250	162	215	87	104	67
RTOR Reduction (vph)	0	17	0	0	3	0	0	41	0	0	0	0
Lane Group Flow (vph)	66	1200	0	195	871	0	250	336	0	0	258	0
Confl. Peds. (#/hr)	7		32	32		7	18		28	28		18
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	5.1	35.8		13.1	43.8		28.9	28.9			26.2	
Effective Green, g (s)	5.1	35.8		13.1	43.8		28.9	28.9			26.2	
Actuated g/C Ratio	0.04	0.30		0.11	0.36		0.24	0.24			0.22	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	75	988		193	1255		426	394			378	
v/s Ratio Prot	0.04	c0.36		c0.11	0.25		0.14	c0.21			c0.15	
v/s Ratio Perm												
v/c Ratio	0.88	1.21		1.01	0.69		0.59	0.85			0.68	
Uniform Delay, d1	57.1	42.1		53.5	32.4		40.3	43.5			43.1	
Progression Factor	0.66	0.68		1.08	0.25		1.00	1.00			1.00	
Incremental Delay, d2	58.6	105.0		35.0	0.8		1.7	16.0			4.6	
Delay (s)	96.0	133.7		92.5	8.8		42.0	59.5			47.7	
Level of Service	F	F		F	A		D	E			D	
Approach Delay (s)		131.8			24.0			52.5			47.7	
Approach LOS		F			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	74.1	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	99.4%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1377	196	505	1066	0	0	0	0	286	0	427
Future Volume (vph)	0	1377	196	505	1066	0	0	0	0	286	0	427
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1497	213	549	1159	0	0	0	0	311	0	464
RTOR Reduction (vph)	0	0	52	0	0	0	0	0	0	0	0	88
Lane Group Flow (vph)	0	1497	161	549	1159	0	0	0	0	0	311	376
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		44.0	44.0	16.0	64.0						22.0	22.0
Effective Green, g (s)		44.0	44.0	16.0	64.0						22.0	22.0
Actuated g/C Ratio		0.47	0.47	0.17	0.68						0.23	0.23
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1656	726	573	2409						406	363
v/s Ratio Prot		c0.42	0.10	c0.16	0.33							
v/s Ratio Perm											0.18	c0.24
v/c Ratio		0.90	0.22	0.96	0.48						0.77	1.04
Uniform Delay, d1		23.1	14.8	38.7	7.1						33.6	36.0
Progression Factor		0.84	0.45	0.98	0.75						1.00	1.00
Incremental Delay, d2		8.1	0.7	26.3	0.7						8.4	56.7
Delay (s)		27.4	7.4	64.0	6.0						42.0	92.7
Level of Service		C	A	E	A						D	F
Approach Delay (s)		24.9			24.6			0.0			72.4	
Approach LOS		C			C			A			E	

Intersection Summary				
HCM 2000 Control Delay	33.6	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	78.3%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1631	144	430	1410	0	0	0	0	408	1	422
Future Volume (vph)	0	1631	144	430	1410	0	0	0	0	408	1	422
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1740	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1740	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1773	157	467	1533	0	0	0	0	443	1	459
RTOR Reduction (vph)	0	0	25	0	0	0	0	0	0	0	0	42
Lane Group Flow (vph)	0	1773	132	467	1533	0	0	0	0	0	444	417
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Perm	Prot	NA					Prot	NA	Perm
Protected Phases		4		3	8					1	6	
Permitted Phases			4									6
Actuated Green, G (s)		62.0	62.0	17.0	83.0						29.0	29.0
Effective Green, g (s)		62.0	62.0	17.0	83.0						29.0	29.0
Actuated g/C Ratio		0.52	0.52	0.14	0.69						0.24	0.24
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1828	802	476	2447						420	375
v/s Ratio Prot		c0.50		c0.14	0.43							
v/s Ratio Perm			0.08								0.26	c0.27
v/c Ratio		0.97	0.16	0.98	0.63						1.06	1.11
Uniform Delay, d1		28.1	15.3	51.3	10.1						45.5	45.5
Progression Factor		0.62	0.77	0.89	1.08						1.00	1.00
Incremental Delay, d2		13.3	0.4	34.6	1.1						59.8	79.9
Delay (s)		30.7	12.2	80.2	12.0						105.3	125.4
Level of Service		C	B	F	B						F	F
Approach Delay (s)		29.2			27.9			0.0			115.5	
Approach LOS		C			C			A			F	

Intersection Summary				
HCM 2000 Control Delay	44.8	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	1.01			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	90.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1215	482	0	1649	144	319
Future Volume (vph)	1215	482	0	1649	144	319
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1279	507	0	1736	152	336
RTOR Reduction (vph)	0	107	0	0	0	144
Lane Group Flow (vph)	1279	400	0	1736	152	192
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	74.2	74.2		74.2	11.8	11.8
Effective Green, g (s)	74.2	74.2		74.2	11.8	11.8
Actuated g/C Ratio	0.79	0.79		0.79	0.13	0.13
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2793	1249		3661	422	343
v/s Ratio Prot	0.36			c0.37		
v/s Ratio Perm		0.25			0.05	c0.07
v/c Ratio	0.46	0.32		0.47	0.36	0.56
Uniform Delay, d1	3.3	2.8		3.3	37.6	38.7
Progression Factor	0.45	0.23		1.82	1.00	1.00
Incremental Delay, d2	0.4	0.5		0.4	0.5	2.0
Delay (s)	1.9	1.2		6.4	38.2	40.6
Level of Service	A	A		A	D	D
Approach Delay (s)	1.7			6.4	39.9	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.49			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	51.4%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1619	426	0	1953	187	572
Future Volume (vph)	1619	426	0	1953	187	572
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1704	448	0	2056	197	602
RTOR Reduction (vph)	0	102	0	0	0	40
Lane Group Flow (vph)	1704	346	0	2056	197	562
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	82.4	82.4		82.4	29.6	29.6
Effective Green, g (s)	82.4	82.4		82.4	29.6	29.6
Actuated g/C Ratio	0.69	0.69		0.69	0.25	0.25
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2430	1086		3184	830	674
v/s Ratio Prot	c0.48			0.44		
v/s Ratio Perm		0.22			0.06	c0.21
v/c Ratio	0.70	0.32		0.65	0.24	0.83
Uniform Delay, d1	11.4	7.5		10.6	36.2	42.9
Progression Factor	0.24	0.00		1.07	1.00	1.00
Incremental Delay, d2	1.4	0.6		0.8	0.1	8.7
Delay (s)	4.1	0.6		12.2	36.3	51.6
Level of Service	A	A		B	D	D
Approach Delay (s)	3.4			12.2	47.8	
Approach LOS	A			B	D	

Intersection Summary				
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.74			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	71.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	1	18	28	2	10	8	514	16	4	783	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.97		1.00	1.00		1.00	0.98	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1747			1739		1770	1820		1770	1801	
Flt Permitted		0.74			0.81		0.19	1.00		0.40	1.00	
Satd. Flow (perm)		1337			1461		356	1820		746	1801	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	92	1	20	31	2	11	9	571	18	4	870	106
RTOR Reduction (vph)	0	15	0	0	9	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	98	0	0	35	0	9	588	0	4	971	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.7			7.7		38.5	38.5		38.5	38.5	
Effective Green, g (s)		7.7			7.7		38.5	38.5		38.5	38.5	
Actuated g/C Ratio		0.14			0.14		0.71	0.71		0.71	0.71	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		189			207		252	1292		529	1279	
v/s Ratio Prot								0.32			c0.54	
v/s Ratio Perm		c0.07			0.02		0.03			0.01		
v/c Ratio		0.52			0.17		0.04	0.45		0.01	0.76	
Uniform Delay, d1		21.5			20.4		2.3	3.4		2.3	4.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.4			0.4		0.1	0.3		0.0	2.6	
Delay (s)		23.9			20.8		2.4	3.6		2.3	7.6	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		23.9			20.8			3.6			7.6	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	7.6	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	54.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	60.6%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	103	2	12	26	2	9	4	811	36	8	691	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.97		1.00	0.99		1.00	0.99	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1760			1740		1770	1817		1770	1807	
Flt Permitted		0.72			0.81		0.25	1.00		0.20	1.00	
Satd. Flow (perm)		1326			1465		470	1817		367	1807	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	114	2	13	29	2	10	4	901	40	9	768	70
RTOR Reduction (vph)	0	8	0	0	8	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	121	0	0	33	0	4	939	0	9	834	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.5			8.5		36.9	36.9		36.9	36.9	
Effective Green, g (s)		8.5			8.5		36.9	36.9		36.9	36.9	
Actuated g/C Ratio		0.16			0.16		0.69	0.69		0.69	0.69	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		211			233		324	1255		253	1248	
v/s Ratio Prot								c0.52			0.46	
v/s Ratio Perm		c0.09			0.02		0.01			0.02		
v/c Ratio		0.58			0.14		0.01	0.75		0.04	0.67	
Uniform Delay, d1		20.8			19.3		2.6	5.3		2.6	4.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.8			0.3		0.0	2.5		0.1	1.4	
Delay (s)		24.5			19.6		2.6	7.8		2.7	6.1	
Level of Service		C			B		A	A		A	A	
Approach Delay (s)		24.5			19.6			7.7			6.1	
Approach LOS		C			B			A			A	

Intersection Summary				
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	53.4	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	59.6%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/28/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	763	509	177	739	812
Future Volume (vph)	0	763	509	177	739	812
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	838	559	195	812	892
RTOR Reduction (vph)	0	0	0	0	0	213
Lane Group Flow (vph)	0	838	559	195	812	679
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		38.4	38.4	73.9	27.5	27.5
Effective Green, g (s)		38.4	38.4	73.9	27.5	27.5
Actuated g/C Ratio		0.52	0.52	1.00	0.37	0.37
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1769	1838	1524	1229	998
v/s Ratio Prot		c0.25	0.16			
v/s Ratio Perm				0.13	0.25	c0.25
v/c Ratio		0.47	0.30	0.13	0.66	0.68
Uniform Delay, d1		11.3	10.1	0.0	19.3	19.5
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.9	0.4	0.2	1.3	1.9
Delay (s)		12.2	10.6	0.2	20.7	21.4
Level of Service		B	B	A	C	C
Approach Delay (s)		12.2	7.9		21.1	
Approach LOS		B	A		C	

Intersection Summary				
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.56			
Actuated Cycle Length (s)	73.9	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	49.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/28/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1141	560	329	421	521
Future Volume (vph)	0	1141	560	329	421	521
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1176	577	339	434	537
RTOR Reduction (vph)	0	0	0	0	0	445
Lane Group Flow (vph)	0	1176	577	339	434	92
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		66.0	66.0	89.2	15.2	15.2
Effective Green, g (s)		66.0	66.0	89.2	15.2	15.2
Actuated g/C Ratio		0.74	0.74	1.00	0.17	0.17
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2520	2618	1524	562	457
v/s Ratio Prot		c0.35	0.16			
v/s Ratio Perm				0.22	c0.13	0.03
v/c Ratio		0.47	0.22	0.22	0.77	0.20
Uniform Delay, d1		4.6	3.6	0.0	35.3	31.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.6	0.2	0.3	6.5	0.2
Delay (s)		5.2	3.8	0.3	41.9	32.0
Level of Service		A	A	A	D	C
Approach Delay (s)		5.2	2.5		36.4	
Approach LOS		A	A		D	

Intersection Summary				
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	89.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	50.2%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1032	349	0	957	113	391
Future Volume (vph)	1032	349	0	957	113	391
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1098	371	0	1018	120	416
RTOR Reduction (vph)	0	0	0	0	0	100
Lane Group Flow (vph)	1098	371	0	1018	120	316
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	48.1	69.3		48.1	13.2	13.2
Effective Green, g (s)	48.1	69.3		48.1	13.2	13.2
Actuated g/C Ratio	0.69	1.00		0.69	0.19	0.19
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2364	1583		2364	629	510
v/s Ratio Prot	c0.32			0.30		
v/s Ratio Perm		0.23			0.04	c0.12
v/c Ratio	0.46	0.23		0.43	0.19	0.62
Uniform Delay, d1	4.8	0.0		4.6	23.6	25.8
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.3		0.6	0.1	2.3
Delay (s)	5.4	0.3		5.2	23.7	28.1
Level of Service	A	A		A	C	C
Approach Delay (s)	4.2			5.2	27.1	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	69.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	48.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	852	585	0	1457	83	258
Future Volume (vph)	852	585	0	1457	83	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3406	1583		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3406	1583		3406	3303	2682
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	888	609	0	1518	86	269
RTOR Reduction (vph)	0	0	0	0	0	242
Lane Group Flow (vph)	888	609	0	1518	86	27
Heavy Vehicles (%)	6%	2%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	58.4	73.8		58.4	7.4	7.4
Effective Green, g (s)	58.4	73.8		58.4	7.4	7.4
Actuated g/C Ratio	0.79	1.00		0.79	0.10	0.10
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2695	1583		2695	331	268
v/s Ratio Prot	0.26			c0.45		
v/s Ratio Perm		c0.38			0.03	0.01
v/c Ratio	0.33	0.38		0.56	0.26	0.10
Uniform Delay, d1	2.2	0.0		2.9	30.7	30.2
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	0.7		0.9	0.4	0.2
Delay (s)	2.5	0.7		3.8	31.1	30.3
Level of Service	A	A		A	C	C
Approach Delay (s)	1.8			3.8	30.5	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	73.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	50.3%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	8	0	38	2	183	0	509	57	187	743	1
Future Volume (vph)	4	8	0	38	2	183	0	509	57	187	743	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98			1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		1.00			0.89			0.98		1.00	1.00	
Flt Protected		0.98			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1830			1602			3415		1770	3471	
Flt Permitted		0.87			0.94			1.00		0.95	1.00	
Satd. Flow (perm)		1629			1525			3415		1770	3471	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	5	9	0	43	2	208	0	578	65	212	844	1
RTOR Reduction (vph)	0	0	0	0	174	0	0	9	0	0	0	0
Lane Group Flow (vph)	0	14	0	0	79	0	0	634	0	213	845	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		10.6			10.6			30.1		10.8	44.9	
Effective Green, g (s)		10.6			10.6			30.6		10.8	45.4	
Actuated g/C Ratio		0.17			0.17			0.48		0.17	0.71	
Clearance Time (s)		4.0			4.0			4.5		4.0	4.5	
Vehicle Extension (s)		4.0			4.0			4.0		1.0	4.0	
Lane Grp Cap (vph)		269			252			1632		298	2462	
v/s Ratio Prot								c0.19		c0.12	0.24	
v/s Ratio Perm		0.01			c0.05							
v/c Ratio		0.05			0.32			0.39		0.71	0.34	
Uniform Delay, d1		22.5			23.5			10.7		25.1	3.6	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.1			1.0			0.7		6.6	0.1	
Delay (s)		22.6			24.5			11.4		31.8	3.7	
Level of Service		C			C			B		C	A	
Approach Delay (s)		22.6			24.5			11.4			9.3	
Approach LOS		C			C			B			A	

Intersection Summary				
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	64.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	51.4%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	5	1	69	8	274	2	824	43	187	687	1
Future Volume (vph)	2	5	1	69	8	274	2	824	43	187	687	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.89		1.00	0.99		1.00	1.00	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1802			1615		1770	3444		1770	3470	
Flt Permitted		0.93			0.93		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1701			1524		1770	3444		1770	3470	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	2	5	1	71	8	282	2	849	44	193	708	1
RTOR Reduction (vph)	0	1	0	0	145	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	7	0	0	216	0	2	889	0	193	709	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		13.1			13.1		0.7	26.3		10.6	36.2	
Effective Green, g (s)		13.1			13.1		0.7	26.8		10.6	36.7	
Actuated g/C Ratio		0.21			0.21		0.01	0.43		0.17	0.59	
Clearance Time (s)		4.0			4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)		2.0			2.0		2.0	4.0		1.0	4.0	
Lane Grp Cap (vph)		356			319		19	1476		300	2037	
v/s Ratio Prot							0.00	c0.26		c0.11	0.20	
v/s Ratio Perm		0.00			c0.14							
v/c Ratio		0.02			0.68		0.11	0.60		0.64	0.35	
Uniform Delay, d1		19.6			22.7		30.6	13.7		24.2	6.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			4.4		0.9	0.8		3.5	0.1	
Delay (s)		19.6			27.2		31.5	14.6		27.7	6.8	
Level of Service		B			C		C	B		C	A	
Approach Delay (s)		19.6			27.2			14.6			11.3	
Approach LOS		B			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	62.5	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	70.8%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	83	1	18	24	2	10	8	514	7	4	783	95
Future Volume (Veh/h)	83	1	18	24	2	10	8	514	7	4	783	95
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	92	1	20	27	2	11	9	571	8	4	870	106
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.90	0.90		0.90	0.90	0.90				0.90		
vC, conflicting volume	1532	1528	923	1492	1577	575	976			579		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1536	1531	923	1491	1586	470	976			475		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	99	94	68	98	98	99			100		
cM capacity (veh/h)	81	103	327	84	96	533	707			977		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	113	40	9	579	4	976
Volume Left	92	27	9	0	4	0
Volume Right	20	11	0	8	0	106
cSH	94	110	707	1700	977	1700
Volume to Capacity	1.21	0.36	0.01	0.34	0.00	0.57
Queue Length 95th (ft)	196	37	1	0	0	0
Control Delay (s)	241.5	55.0	10.2	0.0	8.7	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	241.5	55.0	0.2		0.0	
Approach LOS	F	F				

Intersection Summary					
Average Delay	17.2				
Intersection Capacity Utilization	60.8%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	2	12	22	2	9	4	811	15	8	691	63
Future Volume (Veh/h)	103	2	12	22	2	9	4	811	15	8	691	63
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	114	2	13	24	2	10	4	901	17	9	768	70
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.83	0.83		0.83	0.83	0.83				0.83		
vC, conflicting volume	1741	1747	803	1718	1774	910	838			918		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1790	1797	803	1762	1829	789	838			799		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	97	97	53	97	97	99			99		
cM capacity (veh/h)	49	65	383	51	62	324	796			684		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	129	36	4	918	9	838
Volume Left	114	24	4	0	9	0
Volume Right	13	10	0	17	0	70
cSH	54	67	796	1700	684	1700
Volume to Capacity	2.41	0.54	0.01	0.54	0.01	0.49
Queue Length 95th (ft)	328	55	0	0	1	0
Control Delay (s)	805.2	108.3	9.5	0.0	10.3	0.0
Lane LOS	F	F	A		B	
Approach Delay (s)	805.2	108.3	0.0		0.1	
Approach LOS	F	F				

Intersection Summary					
Average Delay	55.8				
Intersection Capacity Utilization	58.7%	ICU Level of Service		B	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	223	639	86	141	601	42	37	275	175	73	353	317
Future Volume (vph)	223	639	86	141	601	42	37	275	175	73	353	317
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3404		1770	3435		1770	1644	1563	1770	1644	1562
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3404		1770	3435		1770	1644	1563	1770	1644	1562
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	248	710	96	157	668	47	41	306	194	81	392	352
RTOR Reduction (vph)	0	10	0	0	5	0	0	0	48	0	0	64
Lane Group Flow (vph)	248	796	0	157	710	0	41	306	146	81	392	288
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Parking (#/hr)								0			0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	15.3	34.9		10.9	30.5		3.6	27.0	37.9	5.2	28.6	43.9
Effective Green, g (s)	15.3	34.9		10.9	30.5		3.6	27.0	37.9	5.2	28.6	43.9
Actuated g/C Ratio	0.16	0.37		0.12	0.32		0.04	0.29	0.40	0.06	0.30	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	288	1263		205	1114		67	472	696	97	500	795
v/s Ratio Prot	c0.14	c0.23		0.09	0.21		0.02	0.19	0.02	c0.05	c0.24	0.06
v/s Ratio Perm									0.07			0.13
v/c Ratio	0.86	0.63		0.77	0.64		0.61	0.65	0.21	0.84	0.78	0.36
Uniform Delay, d1	38.3	24.3		40.3	27.0		44.5	29.3	18.3	44.0	29.9	16.1
Progression Factor	1.00	1.00		1.00	1.36		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	21.6	2.4		13.8	2.7		11.1	3.4	0.1	41.7	8.3	0.1
Delay (s)	59.9	26.6		54.1	39.5		55.6	32.8	18.3	85.7	38.2	16.2
Level of Service	E	C		D	D		E	C	B	F	D	B
Approach Delay (s)		34.5			42.1			29.3			33.5	
Approach LOS		C			D			C			C	

Intersection Summary				
HCM 2000 Control Delay	35.4	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	70.9%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	309	660	59	218	527	108	55	341	240	141	351	331
Future Volume (vph)	309	660	59	218	527	108	55	341	240	141	351	331
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3423		1770	3376		1770	1827	1564	1770	1827	1563
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3423		1770	3376		1770	1827	1564	1770	1827	1563
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	312	667	60	220	532	109	56	344	242	142	355	334
RTOR Reduction (vph)	0	5	0	0	13	0	0	0	59	0	0	76
Lane Group Flow (vph)	312	722	0	220	628	0	56	344	183	142	355	258
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	24.3	45.9		17.8	39.4		6.6	28.0	45.8	12.3	33.7	58.0
Effective Green, g (s)	24.3	45.9		17.8	39.4		6.6	28.0	45.8	12.3	33.7	58.0
Actuated g/C Ratio	0.20	0.38		0.15	0.33		0.05	0.23	0.38	0.10	0.28	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	358	1309		262	1108		97	426	649	181	513	807
v/s Ratio Prot	c0.18	c0.21		0.12	0.19		0.03	c0.19	0.04	c0.08	0.19	0.06
v/s Ratio Perm									0.08			0.10
v/c Ratio	0.87	0.55		0.84	0.57		0.58	0.81	0.28	0.78	0.69	0.32
Uniform Delay, d1	46.3	29.0		49.7	33.3		55.3	43.5	25.7	52.6	38.5	18.9
Progression Factor	1.00	1.00		1.26	0.46		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.5	1.7		18.7	2.0		5.1	11.3	0.1	18.3	4.3	0.1
Delay (s)	65.9	30.7		81.2	17.3		60.4	54.7	25.8	70.8	42.8	19.0
Level of Service	E	C		F	B		E	D	C	E	D	B
Approach Delay (s)		41.2			33.6			44.3			38.1	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	39.1	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.74			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	79.5%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St 9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	884	4	5	779	11	0	0	0	0	0	5
Future Volume (Veh/h)	0	884	4	5	779	11	0	0	0	0	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	921	4	5	811	11	0	0	0	0	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked				0.82			0.82	0.82	0.82	0.82	0.82	
vC, conflicting volume	822			925			1344	1755	462	1287	1752	411
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	822			467			978	1480	0	909	1476	411
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	100	100	100	99
cM capacity (veh/h)	803			893			166	101	888	188	102	590

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	460	464	5	541	281	5
Volume Left	0	0	5	0	0	0
Volume Right	0	4	0	0	11	5
cSH	803	1700	893	1700	1700	590
Volume to Capacity	0.00	0.27	0.01	0.32	0.17	0.01
Queue Length 95th (ft)	0	0	0	0	0	1
Control Delay (s)	0.0	0.0	9.1	0.0	0.0	11.2
Lane LOS			A			B
Approach Delay (s)	0.0		0.1			11.2
Approach LOS						B

Intersection Summary						
Average Delay	0.1					
Intersection Capacity Utilization	34.6%	ICU Level of Service	A			
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St 9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1013	23	14	827	44	0	0	0	0	0	26
Future Volume (Veh/h)	5	1013	23	14	827	44	0	0	0	0	0	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	5	1055	24	15	861	46	0	0	0	0	0	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.92			0.84			0.88	0.88	0.84	0.88	0.88	0.92
vC, conflicting volume	907			1079			1564	2014	540	1452	2003	454
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	718			712			947	1457	69	819	1445	223
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	100	100	100	100	96
cM capacity (veh/h)	806			742			179	110	823	231	112	715

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	532	552	15	574	333	27
Volume Left	5	0	15	0	0	0
Volume Right	0	24	0	0	46	27
cSH	806	1700	742	1700	1700	715
Volume to Capacity	0.01	0.32	0.02	0.34	0.20	0.04
Queue Length 95th (ft)	0	0	2	0	0	3
Control Delay (s)	0.2	0.0	10.0	0.0	0.0	10.2
Lane LOS	A		A			B
Approach Delay (s)	0.1		0.2			10.2
Approach LOS						B

Intersection Summary						
Average Delay	0.3					
Intersection Capacity Utilization	42.2%	ICU Level of Service	A			
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	755	180	185	775	27	198	116	163	48	129	42
Future Volume (vph)	27	755	180	185	775	27	198	116	163	48	129	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.91			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3350		1770	3452		1770	1653			1767	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3350		1770	3452		1770	1653			1767	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	29	803	191	197	824	29	211	123	173	51	137	45
RTOR Reduction (vph)	0	21	0	0	2	0	0	64	0	0	0	0
Lane Group Flow (vph)	29	973	0	197	851	0	211	232	0	0	233	0
Confl. Peds. (#/hr)	1		7	7		1			2	2		
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	5.8	33.5		12.9	40.6		14.3	14.3			17.3	
Effective Green, g (s)	5.8	33.5		12.9	40.6		14.3	14.3			17.3	
Actuated g/C Ratio	0.06	0.36		0.14	0.43		0.15	0.15			0.18	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	109	1193		242	1490		269	251			325	
v/s Ratio Prot	0.02	c0.29		c0.11	0.25		0.12	c0.14			c0.13	
v/s Ratio Perm												
v/c Ratio	0.27	0.82		0.81	0.57		0.78	0.93			0.72	
Uniform Delay, d1	42.1	27.5		39.4	20.1		38.4	39.3			36.0	
Progression Factor	0.90	0.86		1.19	1.78		1.00	1.00			1.00	
Incremental Delay, d2	0.4	5.8		13.4	1.2		13.4	37.0			6.9	
Delay (s)	38.2	29.3		60.1	37.0		51.8	76.4			42.9	
Level of Service	D	C		E	D		D	E			D	
Approach Delay (s)		29.6			41.3			66.1			42.9	
Approach LOS		C			D			E			D	

Intersection Summary				
HCM 2000 Control Delay	41.6	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.81			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	79.2%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	925	219	183	779	42	235	152	202	82	98	63
Future Volume (vph)	62	925	219	183	779	42	235	152	202	82	98	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	0.97			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.91			0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1770	3314		1770	3439		1770	1636			1735	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (perm)	1770	3314		1770	3439		1770	1636			1735	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	66	984	233	195	829	45	250	162	215	87	104	67
RTOR Reduction (vph)	0	17	0	0	3	0	0	41	0	0	0	0
Lane Group Flow (vph)	66	1200	0	195	871	0	250	336	0	0	258	0
Confl. Peds. (#/hr)	7		32	32		7	18		28	28		18
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	5.1	35.8		13.1	43.8		28.9	28.9			26.2	
Effective Green, g (s)	5.1	35.8		13.1	43.8		28.9	28.9			26.2	
Actuated g/C Ratio	0.04	0.30		0.11	0.36		0.24	0.24			0.22	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	75	988		193	1255		426	394			378	
v/s Ratio Prot	0.04	c0.36		c0.11	0.25		0.14	c0.21			c0.15	
v/s Ratio Perm												
v/c Ratio	0.88	1.21		1.01	0.69		0.59	0.85			0.68	
Uniform Delay, d1	57.1	42.1		53.5	32.4		40.3	43.5			43.1	
Progression Factor	0.66	0.68		1.08	0.25		1.00	1.00			1.00	
Incremental Delay, d2	58.6	105.0		35.0	0.8		1.7	16.0			4.6	
Delay (s)	96.1	133.8		92.5	8.8		42.0	59.5			47.7	
Level of Service	F	F		F	A		D	E			D	
Approach Delay (s)		131.8			24.0			52.5			47.7	
Approach LOS		F			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	74.2	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	99.4%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1377	196	505	1066	0	0	0	0	286	0	427
Future Volume (vph)	0	1377	196	505	1066	0	0	0	0	286	0	427
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1497	213	549	1159	0	0	0	0	311	0	464
RTOR Reduction (vph)	0	0	52	0	0	0	0	0	0	0	0	88
Lane Group Flow (vph)	0	1497	161	549	1159	0	0	0	0	0	311	376
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		44.0	44.0	16.0	64.0						22.0	22.0
Effective Green, g (s)		44.0	44.0	16.0	64.0						22.0	22.0
Actuated g/C Ratio		0.47	0.47	0.17	0.68						0.23	0.23
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1656	726	573	2409						406	363
v/s Ratio Prot		c0.42	0.10	c0.16	0.33							
v/s Ratio Perm											0.18	c0.24
v/c Ratio		0.90	0.22	0.96	0.48						0.77	1.04
Uniform Delay, d1		23.1	14.8	38.7	7.1						33.6	36.0
Progression Factor		0.84	0.45	0.98	0.75						1.00	1.00
Incremental Delay, d2		8.1	0.7	26.3	0.7						8.4	56.7
Delay (s)		27.4	7.4	64.0	6.0						42.0	92.7
Level of Service		C	A	E	A						D	F
Approach Delay (s)		24.9			24.6			0.0			72.4	
Approach LOS		C			C			A			E	

Intersection Summary				
HCM 2000 Control Delay	33.6	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	78.3%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1631	144	430	1410	0	0	0	0	408	1	422
Future Volume (vph)	0	1631	144	430	1410	0	0	0	0	408	1	422
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1740	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1740	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1773	157	467	1533	0	0	0	0	443	1	459
RTOR Reduction (vph)	0	0	25	0	0	0	0	0	0	0	0	42
Lane Group Flow (vph)	0	1773	132	467	1533	0	0	0	0	0	444	417
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Perm	Prot	NA					Prot	NA	Perm
Protected Phases		4		3	8					1	6	
Permitted Phases			4									6
Actuated Green, G (s)		62.0	62.0	17.0	83.0						29.0	29.0
Effective Green, g (s)		62.0	62.0	17.0	83.0						29.0	29.0
Actuated g/C Ratio		0.52	0.52	0.14	0.69						0.24	0.24
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1828	802	476	2447						420	375
v/s Ratio Prot		c0.50		c0.14	0.43							
v/s Ratio Perm			0.08								0.26	c0.27
v/c Ratio		0.97	0.16	0.98	0.63						1.06	1.11
Uniform Delay, d1		28.1	15.3	51.3	10.1						45.5	45.5
Progression Factor		0.62	0.77	0.89	1.08						1.00	1.00
Incremental Delay, d2		13.3	0.4	34.6	1.1						59.8	79.9
Delay (s)		30.7	12.2	80.2	12.0						105.3	125.4
Level of Service		C	B	F	B						F	F
Approach Delay (s)		29.2			27.9			0.0			115.5	
Approach LOS		C			C			A			F	

Intersection Summary				
HCM 2000 Control Delay	44.8	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	1.01			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	90.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1215	482	0	1649	144	319
Future Volume (vph)	1215	482	0	1649	144	319
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1279	507	0	1736	152	336
RTOR Reduction (vph)	0	107	0	0	0	144
Lane Group Flow (vph)	1279	400	0	1736	152	192
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	74.2	74.2		74.2	11.8	11.8
Effective Green, g (s)	74.2	74.2		74.2	11.8	11.8
Actuated g/C Ratio	0.79	0.79		0.79	0.13	0.13
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2793	1249		3661	422	343
v/s Ratio Prot	0.36			c0.37		
v/s Ratio Perm		0.25			0.05	c0.07
v/c Ratio	0.46	0.32		0.47	0.36	0.56
Uniform Delay, d1	3.3	2.8		3.3	37.6	38.7
Progression Factor	0.45	0.23		1.82	1.00	1.00
Incremental Delay, d2	0.4	0.5		0.4	0.5	2.0
Delay (s)	1.9	1.2		6.4	38.2	40.6
Level of Service	A	A		A	D	D
Approach Delay (s)	1.7			6.4	39.9	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.49			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	51.4%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/28/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1619	426	0	1953	187	572
Future Volume (vph)	1619	426	0	1953	187	572
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		4638	3367	2733
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1704	448	0	2056	197	602
RTOR Reduction (vph)	0	102	0	0	0	40
Lane Group Flow (vph)	1704	346	0	2056	197	562
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	82.4	82.4		82.4	29.6	29.6
Effective Green, g (s)	82.4	82.4		82.4	29.6	29.6
Actuated g/C Ratio	0.69	0.69		0.69	0.25	0.25
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2430	1086		3184	830	674
v/s Ratio Prot	c0.48			0.44		
v/s Ratio Perm		0.22			0.06	c0.21
v/c Ratio	0.70	0.32		0.65	0.24	0.83
Uniform Delay, d1	11.4	7.5		10.6	36.2	42.9
Progression Factor	0.24	0.00		1.07	1.00	1.00
Incremental Delay, d2	1.4	0.6		0.8	0.1	8.7
Delay (s)	4.1	0.6		12.2	36.3	51.6
Level of Service	A	A		B	D	D
Approach Delay (s)	3.4			12.2	47.8	
Approach LOS	A			B	D	

Intersection Summary				
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.74			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	71.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	1	18	24	2	10	8	514	7	4	783	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.96		1.00	1.00		1.00	0.98	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1747			1735		1770	1824		1770	1801	
Flt Permitted		0.74			0.82		0.19	1.00		0.41	1.00	
Satd. Flow (perm)		1342			1478		357	1824		757	1801	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	92	1	20	27	2	11	9	571	8	4	870	106
RTOR Reduction (vph)	0	15	0	0	9	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	98	0	0	31	0	9	578	0	4	971	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.7			7.7		38.7	38.7		38.7	38.7	
Effective Green, g (s)		7.7			7.7		38.7	38.7		38.7	38.7	
Actuated g/C Ratio		0.14			0.14		0.71	0.71		0.71	0.71	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		189			209		253	1297		538	1281	
v/s Ratio Prot								0.32			c0.54	
v/s Ratio Perm		c0.07			0.02		0.03			0.01		
v/c Ratio		0.52			0.15		0.04	0.45		0.01	0.76	
Uniform Delay, d1		21.6			20.5		2.3	3.3		2.3	4.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.4			0.3		0.1	0.2		0.0	2.6	
Delay (s)		24.0			20.8		2.4	3.6		2.3	7.5	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		24.0			20.8			3.5			7.5	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	7.5	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	54.4	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	60.8%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	103	2	12	22	2	9	4	811	15	8	691	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1760			1735		1770	1822		1770	1807	
Flt Permitted		0.72			0.83		0.25	1.00		0.21	1.00	
Satd. Flow (perm)		1332			1484		466	1822		385	1807	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	114	2	13	24	2	10	4	901	17	9	768	70
RTOR Reduction (vph)	0	8	0	0	8	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	121	0	0	28	0	4	917	0	9	834	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.5			8.5		36.1	36.1		36.1	36.1	
Effective Green, g (s)		8.5			8.5		36.1	36.1		36.1	36.1	
Actuated g/C Ratio		0.16			0.16		0.69	0.69		0.69	0.69	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		215			239		319	1250		264	1240	
v/s Ratio Prot								c0.50			0.46	
v/s Ratio Perm		c0.09			0.02		0.01			0.02		
v/c Ratio		0.56			0.12		0.01	0.73		0.03	0.67	
Uniform Delay, d1		20.3			18.8		2.6	5.2		2.6	4.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.4			0.2		0.0	2.3		0.1	1.5	
Delay (s)		23.7			19.1		2.6	7.5		2.7	6.3	
Level of Service		C			B		A	A		A	A	
Approach Delay (s)		23.7			19.1			7.5			6.2	
Approach LOS		C			B			A			A	

Intersection Summary				
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	52.6	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	58.7%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

3/24/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1170	577	213	690	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1170	577	213	690	500
RTOR Reduction (vph)	0	0	0	0	0	221
Lane Group Flow (vph)	0	1170	577	213	690	279
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		38.2	38.2	67.0	20.8	20.8
Effective Green, g (s)		38.2	38.2	67.0	20.8	20.8
Actuated g/C Ratio		0.57	0.57	1.00	0.31	0.31
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1941	2017	1524	1025	832
v/s Ratio Prot		c0.34	0.16			
v/s Ratio Perm				0.14	c0.21	0.10
v/c Ratio		0.60	0.29	0.14	0.67	0.34
Uniform Delay, d1		9.4	7.4	0.0	20.1	17.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.4	0.4	0.2	1.8	0.2
Delay (s)		10.8	7.8	0.2	21.9	18.0
Level of Service		B	A	A	C	B
Approach Delay (s)		10.8	5.7		20.3	
Approach LOS		B	A		C	

Intersection Summary				
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	58.7%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

3/24/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1520	560	370	360	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1520	560	370	360	390
RTOR Reduction (vph)	0	0	0	0	0	327
Lane Group Flow (vph)	0	1520	560	370	360	63
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		66.0	66.0	88.2	14.2	14.2
Effective Green, g (s)		66.0	66.0	88.2	14.2	14.2
Actuated g/C Ratio		0.75	0.75	1.00	0.16	0.16
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2548	2648	1524	531	431
v/s Ratio Prot		c0.45	0.16			
v/s Ratio Perm				0.24	c0.11	0.02
v/c Ratio		0.60	0.21	0.24	0.68	0.15
Uniform Delay, d1		5.0	3.3	0.0	34.8	31.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.0	0.2	0.4	3.4	0.2
Delay (s)		6.1	3.5	0.4	38.3	31.9
Level of Service		A	A	A	D	C
Approach Delay (s)		6.1	2.3		35.0	
Approach LOS		A	A		C	

Intersection Summary				
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	88.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	59.0%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

3/24/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	955	335	0	1620	160	570
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		3406	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	955	335	0	1620	160	570
RTOR Reduction (vph)	0	0	0	0	0	137
Lane Group Flow (vph)	955	335	0	1620	160	433
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	48.2	73.3		48.2	17.1	17.1
Effective Green, g (s)	48.2	73.3		48.2	17.1	17.1
Actuated g/C Ratio	0.66	1.00		0.66	0.23	0.23
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2327	1524		2239	770	625
v/s Ratio Prot	0.27			c0.48		
v/s Ratio Perm		0.22			0.05	c0.16
v/c Ratio	0.41	0.22		0.72	0.21	0.69
Uniform Delay, d1	5.9	0.0		8.2	22.6	25.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.3		2.1	0.1	3.3
Delay (s)	6.4	0.3		10.3	22.8	29.0
Level of Service	A	A		B	C	C
Approach Delay (s)	4.8			10.3	27.6	
Approach LOS	A			B	C	

Intersection Summary				
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	73.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	56.0%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

3/24/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	603	437	0	2120	210	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		3406	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	603	437	0	2120	210	500
RTOR Reduction (vph)	0	0	0	0	0	429
Lane Group Flow (vph)	603	437	0	2120	210	71
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	57.1	75.9		57.1	10.8	10.8
Effective Green, g (s)	57.1	75.9		57.1	10.8	10.8
Actuated g/C Ratio	0.75	1.00		0.75	0.14	0.14
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2662	1524		2562	469	381
v/s Ratio Prot	0.17			c0.62		
v/s Ratio Perm		0.29			c0.06	0.03
v/c Ratio	0.23	0.29		0.83	0.45	0.19
Uniform Delay, d1	2.8	0.0		6.2	29.8	28.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.5		3.2	0.7	0.2
Delay (s)	3.0	0.5		9.4	30.5	28.9
Level of Service	A	A		A	C	C
Approach Delay (s)	1.9			9.4	29.4	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.77			
Actuated Cycle Length (s)	75.9	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	71.3%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	4	0	0	35	0	215	5	830	30	225	1050	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		1.00			0.88		1.00	0.99		1.00	1.00	
Flt Protected		0.95			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1770			1593		1770	3452		1770	3471	
Flt Permitted		0.38			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		703			1535		1770	3452		1770	3471	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	0	0	35	0	215	5	830	30	225	1050	0
RTOR Reduction (vph)	0	0	0	0	181	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	4	0	0	69	0	5	858	0	225	1050	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		10.6			10.6		0.9	33.3		11.2	43.6	
Effective Green, g (s)		10.6			10.6		0.9	33.8		11.2	44.1	
Actuated g/C Ratio		0.16			0.16		0.01	0.50		0.17	0.65	
Clearance Time (s)		4.0			4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)		4.0			4.0		2.0	4.0		1.0	4.0	
Lane Grp Cap (vph)		110			240		23	1726		293	2264	
v/s Ratio Prot							0.00	0.25		c0.13	c0.30	
v/s Ratio Perm		0.01			c0.04							
v/c Ratio		0.04			0.29		0.22	0.50		0.77	0.46	
Uniform Delay, d1		24.2			25.2		33.0	11.2		27.0	5.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.9		1.7	1.0		10.4	0.2	
Delay (s)		24.4			26.1		34.7	12.3		37.3	6.1	
Level of Service		C			C		C	B		D	A	
Approach Delay (s)		24.4			26.1			12.4			11.6	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	67.6	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	60.7%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	3	1	79	0	405	0	1110	50	215	1030	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frpb, ped/bikes		0.99			0.98			1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		0.98			0.89			0.99		1.00	1.00	
Flt Protected		0.98			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1781			1605			3511		1770	3539	
Flt Permitted		0.89			0.95			1.00		0.95	1.00	
Satd. Flow (perm)		1620			1531			3511		1770	3539	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	3	1	79	0	405	0	1110	50	215	1030	0
RTOR Reduction (vph)	0	1	0	0	201	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	283	0	0	1157	0	215	1030	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		17.6			17.6			31.0		12.5	47.5	
Effective Green, g (s)		17.6			17.6			31.5		12.5	48.0	
Actuated g/C Ratio		0.24			0.24			0.43		0.17	0.65	
Clearance Time (s)		4.0			4.0			4.5		4.0	4.5	
Vehicle Extension (s)		2.0			2.0			4.0		1.0	4.0	
Lane Grp Cap (vph)		387			366			1502		300	2308	
v/s Ratio Prot								c0.33		c0.12	0.29	
v/s Ratio Perm		0.00			c0.18							
v/c Ratio		0.01			0.77			0.77		0.72	0.45	
Uniform Delay, d1		21.4			26.1			18.0		28.9	6.3	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.0			9.0			2.7		6.6	0.2	
Delay (s)		21.4			35.1			20.6		35.5	6.5	
Level of Service		C			D			C		D	A	
Approach Delay (s)		21.4			35.1			20.6			11.5	
Approach LOS		C			D			C			B	

Intersection Summary				
HCM 2000 Control Delay	19.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	73.6	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	86.8%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	96	0	21	24	0	16	9	577	19	12	862	110
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	96	0	21	24	0	16	9	577	19	12	862	110
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.78	0.78		0.78	0.78	0.78				0.78		
vC, conflicting volume	1552	1555	917	1512	1600	586	972			596		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1566	1570	917	1515	1628	333	972			345		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	94	66	100	97	99			99		
cM capacity (veh/h)	67	84	330	70	78	555	709			950		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	117	40	9	596	12	972
Volume Left	96	24	9	0	12	0
Volume Right	21	16	0	19	0	110
cSH	78	108	709	1700	950	1700
Volume to Capacity	1.49	0.37	0.01	0.35	0.01	0.57
Queue Length 95th (ft)	236	37	1	0	1	0
Control Delay (s)	368.7	56.5	10.1	0.0	8.8	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	368.7	56.5	0.2		0.1	
Approach LOS	F	F				

Intersection Summary					
Average Delay	26.1				
Intersection Capacity Utilization	67.7%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	119	0	14	24	0	16	5	886	20	14	762	73
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	119	0	14	24	0	16	5	886	20	14	762	73
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.67	0.67		0.67	0.67	0.67				0.67		
vC, conflicting volume	1738	1742	798	1710	1769	896	835			906		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1858	1864	798	1816	1904	592	835			607		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	96	37	100	95	99			98		
cM capacity (veh/h)	35	47	386	38	44	337	798			646		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	133	40	5	906	14	835
Volume Left	119	24	5	0	14	0
Volume Right	14	16	0	20	0	73
cSH	39	59	798	1700	646	1700
Volume to Capacity	3.45	0.68	0.01	0.53	0.02	0.49
Queue Length 95th (ft)	Err	72	0	0	2	0
Control Delay (s)	Err	149.5	9.5	0.0	10.7	0.0
Lane LOS	F	F	A		B	
Approach Delay (s)	Err	149.5	0.1		0.2	
Approach LOS	F	F				

Intersection Summary					
Average Delay	691.2				
Intersection Capacity Utilization	65.1%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	139	667	70	145	753	49	70	520	148	75	650	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3417		1770	3437		1770	1644	1561	1770	1644	1559
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3417		1770	3437		1770	1644	1561	1770	1644	1559
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	139	667	70	145	753	49	70	520	148	75	650	150
RTOR Reduction (vph)	0	8	0	0	5	0	0	0	50	0	0	36
Lane Group Flow (vph)	139	729	0	145	797	0	70	520	98	75	650	114
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Parking (#/hr)								0			0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	11.4	29.2		10.2	28.0		4.8	33.8	44.0	4.8	33.8	45.2
Effective Green, g (s)	11.4	29.2		10.2	28.0		4.8	33.8	44.0	4.8	33.8	45.2
Actuated g/C Ratio	0.12	0.31		0.11	0.30		0.05	0.36	0.47	0.05	0.36	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	214	1061		192	1023		90	591	797	90	591	815
v/s Ratio Prot	0.08	0.21		c0.08	c0.23		0.04	0.32	0.01	c0.04	c0.40	0.02
v/s Ratio Perm									0.05			0.06
v/c Ratio	0.65	0.69		0.76	0.78		0.78	0.88	0.12	0.83	1.10	0.14
Uniform Delay, d1	39.4	28.4		40.7	30.2		44.1	28.2	14.1	44.2	30.1	13.6
Progression Factor	1.00	1.00		0.87	1.24		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.0	3.6		13.0	5.5		31.0	14.4	0.0	43.8	67.3	0.0
Delay (s)	44.4	32.0		48.4	42.7		75.1	42.6	14.1	88.0	97.4	13.6
Level of Service	D	C		D	D		E	D	B	F	F	B
Approach Delay (s)		34.0			43.6			40.0			82.2	
Approach LOS		C			D			D			F	

Intersection Summary				
HCM 2000 Control Delay	50.2	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.91			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	83.6%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	719	80	238	795	113	90	640	302	156	600	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3413		1770	3401		1770	1827	1561	1770	1827	1554
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3413		1770	3401		1770	1827	1561	1770	1827	1554
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	157	719	80	238	795	113	90	640	302	156	600	110
RTOR Reduction (vph)	0	7	0	0	9	0	0	0	24	0	0	43
Lane Group Flow (vph)	157	792	0	238	899	0	90	640	278	156	600	67
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	11.0	32.9		17.0	38.9		7.8	42.6	59.6	11.5	46.3	57.3
Effective Green, g (s)	11.0	32.9		17.0	38.9		7.8	42.6	59.6	11.5	46.3	57.3
Actuated g/C Ratio	0.09	0.27		0.14	0.32		0.06	0.36	0.50	0.10	0.39	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	162	935		250	1102		115	648	827	169	704	793
v/s Ratio Prot	0.09	0.23		c0.13	c0.26		0.05	c0.35	0.05	c0.09	c0.33	0.01
v/s Ratio Perm									0.13			0.04
v/c Ratio	0.97	0.85		0.95	0.82		0.78	0.99	0.34	0.92	0.85	0.08
Uniform Delay, d1	54.3	41.2		51.1	37.3		55.3	38.4	18.2	53.8	33.7	17.1
Progression Factor	1.00	1.00		0.68	0.85		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	60.5	9.4		38.5	5.6		26.6	32.0	0.1	46.6	10.1	0.0
Delay (s)	114.8	50.5		73.1	37.3		81.8	70.4	18.3	100.4	43.8	17.1
Level of Service	F	D		E	D		F	E	B	F	D	B
Approach Delay (s)		61.1			44.7			56.2			50.6	
Approach LOS		E			D			E			D	

Intersection Summary				
HCM 2000 Control Delay	52.9	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.93			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	93.0%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	872	18	28	937	9	0	0	0	2	1	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	872	18	28	937	9	0	0	0	2	1	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.94			0.82			0.85	0.85	0.82	0.85	0.85	0.94
vC, conflicting volume	946			890			1416	1883	445	1434	1888	473
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	808			423			805	1354	0	825	1359	304
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	100	99	99	98
cM capacity (veh/h)	762			927			223	122	888	220	122	649

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	436	454	28	625	321	13
Volume Left	0	0	28	0	0	2
Volume Right	0	18	0	0	9	10
cSH	762	1700	927	1700	1700	397
Volume to Capacity	0.00	0.27	0.03	0.37	0.19	0.03
Queue Length 95th (ft)	0	0	2	0	0	3
Control Delay (s)	0.0	0.0	9.0	0.0	0.0	14.4
Lane LOS			A			B
Approach Delay (s)	0.0		0.3			14.4
Approach LOS						B

Intersection Summary					
Average Delay	0.2				
Intersection Capacity Utilization	36.2%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	1144	33	19	1124	30	0	0	0	0	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1144	33	19	1124	30	0	0	0	0	0	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.81			0.78			0.88	0.88	0.78	0.88	0.88	0.81
vC, conflicting volume	1154			1177			1782	2352	588	1749	2354	577
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	734			677			662	1312	0	624	1313	26
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	100	100	100	97
cM capacity (veh/h)	706			715			291	134	851	318	134	850

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	572	605	19	749	405	22
Volume Left	0	0	19	0	0	0
Volume Right	0	33	0	0	30	22
cSH	706	1700	715	1700	1700	850
Volume to Capacity	0.00	0.36	0.03	0.44	0.24	0.03
Queue Length 95th (ft)	0	0	2	0	0	2
Control Delay (s)	0.0	0.0	10.2	0.0	0.0	9.3
Lane LOS			B			A
Approach Delay (s)	0.0		0.2			9.3
Approach LOS						A

Intersection Summary					
Average Delay	0.2				
Intersection Capacity Utilization	42.7%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	574	171	141	857	54	230	210	121	44	240	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.95			0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3328		1770	3437		1770	1718			1789	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3328		1770	3437		1770	1718			1789	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	50	574	171	141	857	54	230	210	121	44	240	40
RTOR Reduction (vph)	0	26	0	0	4	0	0	26	0	0	0	0
Lane Group Flow (vph)	50	719	0	141	907	0	230	305	0	0	324	0
Confl. Peds. (#/hr)	1		7	7		1			2	2		
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	7.7	37.2		6.5	36.0		13.7	13.7			20.6	
Effective Green, g (s)	7.7	37.2		6.5	36.0		13.7	13.7			20.6	
Actuated g/C Ratio	0.08	0.40		0.07	0.38		0.15	0.15			0.22	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	144	1317		122	1316		257	250			392	
v/s Ratio Prot	0.03	c0.22		c0.08	c0.26		0.13	c0.18			c0.18	
v/s Ratio Perm												
v/c Ratio	0.35	0.55		1.16	0.69		0.89	1.22			0.83	
Uniform Delay, d1	40.8	21.9		43.8	24.3		39.4	40.1			35.0	
Progression Factor	0.95	0.99		1.34	1.60		1.00	1.00			1.00	
Incremental Delay, d2	0.5	1.5		114.8	2.0		30.0	128.8			13.0	
Delay (s)	39.4	23.2		173.3	41.0		69.4	168.9			48.0	
Level of Service	D	C		F	D		E	F			D	
Approach Delay (s)		24.2			58.7			128.1			48.0	
Approach LOS		C			E			F			D	

Intersection Summary				
HCM 2000 Control Delay	61.7	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	81.8%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	68	767	257	111	1023	122	450	319	152	60	259	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.97		1.00	0.99		1.00	0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.96		1.00	0.98		1.00	0.95			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3266		1770	3403		1770	1719			1762	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3266		1770	3403		1770	1719			1762	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	68	767	257	111	1023	122	450	319	152	60	259	80
RTOR Reduction (vph)	0	27	0	0	7	0	0	14	0	0	0	0
Lane Group Flow (vph)	68	997	0	111	1138	0	450	457	0	0	399	0
Confl. Peds. (#/hr)	7		32	32		7	18		28	28		18
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	6.0	36.0		8.4	38.4		31.2	31.2			28.4	
Effective Green, g (s)	6.0	36.0		8.4	38.4		31.2	31.2			28.4	
Actuated g/C Ratio	0.05	0.30		0.07	0.32		0.26	0.26			0.24	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	88	979		123	1088		460	446			417	
v/s Ratio Prot	0.04	c0.31		0.06	c0.33		0.25	c0.27			c0.23	
v/s Ratio Perm												
v/c Ratio	0.77	1.02		0.90	1.05		0.98	1.02			0.96	
Uniform Delay, d1	56.3	42.0		55.4	40.8		44.1	44.4			45.2	
Progression Factor	0.60	0.43		1.12	0.31		1.00	1.00			1.00	
Incremental Delay, d2	27.0	31.0		25.7	30.0		35.9	49.0			32.8	
Delay (s)	60.9	48.9		87.9	42.7		80.0	93.4			78.0	
Level of Service	E	D		F	D		E	F			E	
Approach Delay (s)		49.7			46.7			86.8			78.0	
Approach LOS		D			D			F			E	

Intersection Summary				
HCM 2000 Control Delay	61.1	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	1.04			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	99.6%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1018	284	375	882	0	0	0	0	320	0	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1018	284	375	882	0	0	0	0	320	0	265
RTOR Reduction (vph)	0	0	102	0	0	0	0	0	0	0	0	153
Lane Group Flow (vph)	0	1018	182	375	882	0	0	0	0	0	320	112
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		44.0	44.0	16.0	64.0						22.0	22.0
Effective Green, g (s)		44.0	44.0	16.0	64.0						22.0	22.0
Actuated g/C Ratio		0.47	0.47	0.17	0.68						0.23	0.23
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1656	726	573	2409						406	363
v/s Ratio Prot		c0.29	0.12	c0.11	0.25							
v/s Ratio Perm											0.18	0.07
v/c Ratio		0.61	0.25	0.65	0.37						0.79	0.31
Uniform Delay, d1		18.7	15.1	36.4	6.4						33.8	29.7
Progression Factor		0.69	0.53	1.02	0.75						1.00	1.00
Incremental Delay, d2		1.6	0.8	2.5	0.4						9.8	2.2
Delay (s)		14.5	8.8	39.7	5.2						43.6	31.9
Level of Service		B	A	D	A						D	C
Approach Delay (s)		13.3			15.5			0.0			38.3	
Approach LOS		B			B			A			D	

Intersection Summary				
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	66.6%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

3/24/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1307	389	260	1258	0	0	0	0	390	0	404
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1307	389	260	1258	0	0	0	0	390	0	404
RTOR Reduction (vph)	0	0	81	0	0	0	0	0	0	0	0	74
Lane Group Flow (vph)	0	1307	309	260	1258	0	0	0	0	0	390	330
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Perm	Prot	NA					Prot	NA	Perm
Protected Phases		4		3	8					1	6	
Permitted Phases			4									6
Actuated Green, G (s)		64.8	64.8	14.2	83.0						29.0	29.0
Effective Green, g (s)		64.8	64.8	14.2	83.0						29.0	29.0
Actuated g/C Ratio		0.54	0.54	0.12	0.69						0.24	0.24
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1911	838	398	2447						419	375
v/s Ratio Prot		c0.37		c0.08	0.36							
v/s Ratio Perm			0.20								0.22	0.21
v/c Ratio		0.68	0.37	0.65	0.51						0.93	0.88
Uniform Delay, d1		20.1	15.8	50.5	8.9						44.5	43.8
Progression Factor		0.74	0.82	0.96	0.66						1.00	1.00
Incremental Delay, d2		1.5	0.9	3.5	0.7						27.3	24.2
Delay (s)		16.5	13.9	52.0	6.6						71.8	68.0
Level of Service		B	B	D	A						E	E
Approach Delay (s)		15.9			14.4			0.0			69.9	
Approach LOS		B			B			A			E	

Intersection Summary				
HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.75			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	75.2%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

3/24/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1167	0	0	1511	186	238
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			*0.83	0.97	0.88
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3539			4638	3367	2733
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3539			4638	3367	2733
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1167	0	0	1511	186	238
RTOR Reduction (vph)	0	0	0	0	0	183
Lane Group Flow (vph)	1167	0	0	1511	186	55
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	75.5			75.5	10.5	10.5
Effective Green, g (s)	75.5			75.5	10.5	10.5
Actuated g/C Ratio	0.80			0.80	0.11	0.11
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2842			3725	376	305
v/s Ratio Prot	c0.33			0.33		
v/s Ratio Perm					c0.06	0.02
v/c Ratio	0.41			0.41	0.49	0.18
Uniform Delay, d1	2.7			2.7	39.3	37.8
Progression Factor	0.38			1.87	1.00	1.00
Incremental Delay, d2	0.4			0.3	1.0	0.3
Delay (s)	1.4			5.3	40.3	38.1
Level of Service	A			A	D	D
Approach Delay (s)	1.4			5.3	39.1	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.42			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	47.3%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

3/24/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1341	356	0	1726	299	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		4638	3367	2733
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1341	356	0	1726	299	500
RTOR Reduction (vph)	0	86	0	0	0	95
Lane Group Flow (vph)	1341	270	0	1726	299	405
Heavy Vehicles (%)	2%	6%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	88.5	88.5		88.5	23.5	23.5
Effective Green, g (s)	88.5	88.5		88.5	23.5	23.5
Actuated g/C Ratio	0.74	0.74		0.74	0.20	0.20
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2610	1123		3420	659	535
v/s Ratio Prot	c0.38			0.37		
v/s Ratio Perm		0.18			0.09	c0.15
v/c Ratio	0.51	0.24		0.50	0.45	0.76
Uniform Delay, d1	6.7	5.0		6.6	42.6	45.6
Progression Factor	0.18	0.00		1.14	1.00	1.00
Incremental Delay, d2	0.6	0.4		0.4	0.5	6.1
Delay (s)	1.8	0.4		7.9	43.1	51.6
Level of Service	A	A		A	D	D
Approach Delay (s)	1.5			7.9	48.4	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.56			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	61.2%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

3/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	0	21	24	0	16	9	577	19	12	862	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.95		1.00	1.00		1.00	0.98	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1746			1711		1770	1819		1770	1800	
Flt Permitted		0.74			0.84		0.19	1.00		0.40	1.00	
Satd. Flow (perm)		1339			1485		358	1819		737	1800	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	96	0	21	24	0	16	9	577	19	12	862	110
RTOR Reduction (vph)	0	15	0	0	15	0	0	1	0	0	6	0
Lane Group Flow (vph)	0	102	0	0	25	0	9	595	0	12	966	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.8			7.8		38.5	38.5		38.5	38.5	
Effective Green, g (s)		7.8			7.8		38.5	38.5		38.5	38.5	
Actuated g/C Ratio		0.14			0.14		0.71	0.71		0.71	0.71	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		192			213		253	1289		522	1276	
v/s Ratio Prot								0.33			c0.54	
v/s Ratio Perm		c0.08			0.02		0.03			0.02		
v/c Ratio		0.53			0.12		0.04	0.46		0.02	0.76	
Uniform Delay, d1		21.5			20.2		2.4	3.4		2.3	5.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.6			0.2		0.1	0.3		0.0	2.6	
Delay (s)		24.2			20.5		2.4	3.7		2.4	7.6	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		24.2			20.5			3.7			7.5	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	7.6	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	54.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	67.7%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

3/28/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	0	14	24	0	16	5	886	20	14	762	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.95		1.00	1.00		1.00	0.99	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1758			1711		1770	1822		1770	1806	
Flt Permitted		0.72			0.84		0.25	1.00		0.21	1.00	
Satd. Flow (perm)		1321			1478		468	1822		396	1806	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	119	0	14	24	0	16	5	886	20	14	762	73
RTOR Reduction (vph)	0	15	0	0	15	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	118	0	0	25	0	5	905	0	14	831	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.3			8.3		35.4	35.4		35.4	35.4	
Effective Green, g (s)		8.3			8.3		35.4	35.4		35.4	35.4	
Actuated g/C Ratio		0.16			0.16		0.68	0.68		0.68	0.68	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		212			237		320	1247		271	1236	
v/s Ratio Prot								c0.50			0.46	
v/s Ratio Perm		c0.09			0.02		0.01			0.04		
v/c Ratio		0.56			0.11		0.02	0.73		0.05	0.67	
Uniform Delay, d1		20.0			18.5		2.6	5.1		2.7	4.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.1			0.2		0.0	2.1		0.1	1.5	
Delay (s)		23.1			18.7		2.6	7.2		2.7	6.2	
Level of Service		C			B		A	A		A	A	
Approach Delay (s)		23.1			18.7			7.2			6.2	
Approach LOS		C			B			A			A	

Intersection Summary				
HCM 2000 Control Delay	8.1	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.69			
Actuated Cycle Length (s)	51.7	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	65.1%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/27/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1180	579	213	690	502
Future Volume (vph)	0	1180	579	213	690	502
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1180	579	213	690	502
RTOR Reduction (vph)	0	0	0	0	0	219
Lane Group Flow (vph)	0	1180	579	213	690	283
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		38.2	38.2	67.0	20.8	20.8
Effective Green, g (s)		38.2	38.2	67.0	20.8	20.8
Actuated g/C Ratio		0.57	0.57	1.00	0.31	0.31
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1941	2017	1524	1025	832
v/s Ratio Prot		c0.35	0.16			
v/s Ratio Perm				0.14	c0.21	0.11
v/c Ratio		0.61	0.29	0.14	0.67	0.34
Uniform Delay, d1		9.5	7.4	0.0	20.1	17.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.4	0.4	0.2	1.8	0.2
Delay (s)		10.9	7.8	0.2	21.9	18.1
Level of Service		B	A	A	C	B
Approach Delay (s)		10.9	5.7		20.3	
Approach LOS		B	A		C	

Intersection Summary				
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	59.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/27/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1529	565	370	360	393
Future Volume (vph)	0	1529	565	370	360	393
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1529	565	370	360	393
RTOR Reduction (vph)	0	0	0	0	0	330
Lane Group Flow (vph)	0	1529	565	370	360	63
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		66.0	66.0	88.2	14.2	14.2
Effective Green, g (s)		66.0	66.0	88.2	14.2	14.2
Actuated g/C Ratio		0.75	0.75	1.00	0.16	0.16
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2548	2648	1524	531	431
v/s Ratio Prot		c0.45	0.16			
v/s Ratio Perm				0.24	c0.11	0.02
v/c Ratio		0.60	0.21	0.24	0.68	0.15
Uniform Delay, d1		5.1	3.3	0.0	34.8	31.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.1	0.2	0.4	3.4	0.2
Delay (s)		6.1	3.5	0.4	38.3	32.0
Level of Service		A	A	A	D	C
Approach Delay (s)		6.1	2.3		35.0	
Approach LOS		A	A		C	

Intersection Summary				
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	88.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	59.2%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	959	341	0	1622	160	570
Future Volume (vph)	959	341	0	1622	160	570
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		3406	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	959	341	0	1622	160	570
RTOR Reduction (vph)	0	0	0	0	0	136
Lane Group Flow (vph)	959	341	0	1622	160	434
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	48.2	73.3		48.2	17.1	17.1
Effective Green, g (s)	48.2	73.3		48.2	17.1	17.1
Actuated g/C Ratio	0.66	1.00		0.66	0.23	0.23
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2327	1524		2239	770	625
v/s Ratio Prot	0.27			c0.48		
v/s Ratio Perm		0.22			0.05	c0.16
v/c Ratio	0.41	0.22		0.72	0.21	0.69
Uniform Delay, d1	5.9	0.0		8.2	22.6	25.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.3		2.1	0.1	3.4
Delay (s)	6.4	0.3		10.3	22.8	29.1
Level of Service	A	A		B	C	C
Approach Delay (s)	4.8			10.3	27.7	
Approach LOS	A			B	C	

Intersection Summary				
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	73.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	56.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	607	443	0	2125	210	500
Future Volume (vph)	607	443	0	2125	210	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		3406	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	607	443	0	2125	210	500
RTOR Reduction (vph)	0	0	0	0	0	429
Lane Group Flow (vph)	607	443	0	2125	210	71
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	57.1	75.9		57.1	10.8	10.8
Effective Green, g (s)	57.1	75.9		57.1	10.8	10.8
Actuated g/C Ratio	0.75	1.00		0.75	0.14	0.14
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2662	1524		2562	469	381
v/s Ratio Prot	0.17			c0.62		
v/s Ratio Perm		0.29			c0.06	0.03
v/c Ratio	0.23	0.29		0.83	0.45	0.19
Uniform Delay, d1	2.8	0.0		6.2	29.8	28.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.5		3.3	0.7	0.2
Delay (s)	3.0	0.5		9.5	30.5	28.9
Level of Service	A	A		A	C	C
Approach Delay (s)	1.9			9.5	29.4	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.77			
Actuated Cycle Length (s)	75.9	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	71.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	0	35	0	215	5	840	30	225	1054	0
Future Volume (vph)	4	0	0	35	0	215	5	840	30	225	1054	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		1.00			0.88		1.00	0.99		1.00	1.00	
Flt Protected		0.95			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1770			1593		1770	3452		1770	3471	
Flt Permitted		0.38			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		703			1535		1770	3452		1770	3471	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	0	0	35	0	215	5	840	30	225	1054	0
RTOR Reduction (vph)	0	0	0	0	181	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	4	0	0	69	0	5	868	0	225	1054	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		10.6			10.6		0.9	33.3		11.2	43.6	
Effective Green, g (s)		10.6			10.6		0.9	33.8		11.2	44.1	
Actuated g/C Ratio		0.16			0.16		0.01	0.50		0.17	0.65	
Clearance Time (s)		4.0			4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)		4.0			4.0		2.0	4.0		1.0	4.0	
Lane Grp Cap (vph)		110			240		23	1726		293	2264	
v/s Ratio Prot							0.00	c0.25		c0.13	0.30	
v/s Ratio Perm		0.01			c0.04							
v/c Ratio		0.04			0.29		0.22	0.50		0.77	0.47	
Uniform Delay, d1		24.2			25.2		33.0	11.3		27.0	5.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.9		1.7	1.0		10.4	0.2	
Delay (s)		24.4			26.1		34.7	12.3		37.3	6.1	
Level of Service		C			C		C	B		D	A	
Approach Delay (s)		24.4			26.1			12.5			11.6	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	67.6	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	61.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	3	1	79	0	405	0	1119	50	215	1038	0
Future Volume (vph)	2	3	1	79	0	405	0	1119	50	215	1038	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frpb, ped/bikes		0.99			0.98			1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		0.98			0.89			0.99		1.00	1.00	
Flt Protected		0.98			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1781			1605			3512		1770	3539	
Flt Permitted		0.89			0.95			1.00		0.95	1.00	
Satd. Flow (perm)		1618			1530			3512		1770	3539	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	3	1	79	0	405	0	1119	50	215	1038	0
RTOR Reduction (vph)	0	1	0	0	201	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	283	0	0	1166	0	215	1038	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		17.6			17.6			31.2		12.5	47.7	
Effective Green, g (s)		17.6			17.6			31.7		12.5	48.2	
Actuated g/C Ratio		0.24			0.24			0.43		0.17	0.65	
Clearance Time (s)		4.0			4.0			4.5		4.0	4.5	
Vehicle Extension (s)		2.0			2.0			4.0		1.0	4.0	
Lane Grp Cap (vph)		385			364			1508		299	2311	
v/s Ratio Prot								c0.33		c0.12	0.29	
v/s Ratio Perm		0.00			c0.18							
v/c Ratio		0.01			0.78			0.77		0.72	0.45	
Uniform Delay, d1		21.5			26.3			18.0		29.0	6.3	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.0			9.2			2.7		6.7	0.2	
Delay (s)		21.5			35.4			20.7		35.7	6.5	
Level of Service		C			D			C		D	A	
Approach Delay (s)		21.5			35.4			20.7			11.5	
Approach LOS		C			D			C			B	

Intersection Summary				
HCM 2000 Control Delay	19.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	73.8	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	87.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	96	1	21	52	2	26	9	577	35	16	862	110
Future Volume (Veh/h)	96	1	21	52	2	26	9	577	35	16	862	110
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	96	1	21	52	2	26	9	577	35	16	862	110
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.77	0.77		0.77	0.77	0.77				0.77		
vC, conflicting volume	1571	1579	917	1528	1616	594	972			612		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1592	1602	917	1536	1651	328	972			351		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	99	94	22	97	95	99			98		
cM capacity (veh/h)	61	79	330	66	74	551	709			933		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	118	80	9	612	16	972
Volume Left	96	52	9	0	16	0
Volume Right	21	26	0	35	0	110
cSH	72	93	709	1700	933	1700
Volume to Capacity	1.65	0.86	0.01	0.36	0.02	0.57
Queue Length 95th (ft)	254	118	1	0	1	0
Control Delay (s)	443.7	138.0	10.1	0.0	8.9	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	443.7	138.0	0.1		0.1	
Approach LOS	F	F				

Intersection Summary					
Average Delay	35.2				
Intersection Capacity Utilization	67.2%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	119	2	14	50	2	25	5	886	56	22	762	73
Future Volume (Veh/h)	119	2	14	50	2	25	5	886	56	22	762	73
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	119	2	14	50	2	25	5	886	56	22	762	73
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.66	0.66		0.66	0.66	0.66				0.66		
vC, conflicting volume	1764	1794	798	1745	1803	914	835			942		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1901	1946	798	1871	1959	613	835			655		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	95	96	0	95	92	99			96		
cM capacity (veh/h)	30	41	386	33	40	325	798			616		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	135	77	5	942	22	835
Volume Left	119	50	5	0	22	0
Volume Right	14	25	0	56	0	73
cSH	33	46	798	1700	616	1700
Volume to Capacity	4.08	1.66	0.01	0.55	0.04	0.49
Queue Length 95th (ft)	Err	190	0	0	3	0
Control Delay (s)	Err	512.1	9.5	0.0	11.1	0.0
Lane LOS	F	F	A		B	
Approach Delay (s)	Err	512.1	0.1		0.3	
Approach LOS	F	F				

Intersection Summary					
Average Delay	689.3				
Intersection Capacity Utilization	66.7%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	667	70	145	753	60	70	524	148	93	658	152
Future Volume (vph)	140	667	70	145	753	60	70	524	148	93	658	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3417		1770	3430		1770	1644	1561	1770	1644	1559
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3417		1770	3430		1770	1644	1561	1770	1644	1559
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	140	667	70	145	753	60	70	524	148	93	658	152
RTOR Reduction (vph)	0	8	0	0	6	0	0	0	44	0	0	36
Lane Group Flow (vph)	140	729	0	145	807	0	70	524	104	93	658	116
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Parking (#/hr)								0			0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	11.4	29.3		10.2	28.1		4.8	32.4	42.6	6.1	33.7	45.1
Effective Green, g (s)	11.4	29.3		10.2	28.1		4.8	32.4	42.6	6.1	33.7	45.1
Actuated g/C Ratio	0.12	0.31		0.11	0.30		0.05	0.34	0.45	0.06	0.36	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	214	1065		192	1025		90	566	773	114	589	814
v/s Ratio Prot	0.08	0.21		c0.08	c0.24		0.04	0.32	0.01	c0.05	c0.40	0.02
v/s Ratio Perm									0.05			0.06
v/c Ratio	0.65	0.68		0.76	0.79		0.78	0.93	0.13	0.82	1.12	0.14
Uniform Delay, d1	39.4	28.3		40.7	30.2		44.1	29.6	15.0	43.4	30.1	13.6
Progression Factor	1.00	1.00		0.86	1.25		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.4	3.6		13.0	5.7		31.0	21.5	0.0	32.9	73.6	0.0
Delay (s)	44.8	31.9		48.1	43.4		75.1	51.1	15.0	76.3	103.7	13.7
Level of Service	D	C		D	D		E	D	B	E	F	B
Approach Delay (s)		33.9			44.1			46.2			85.8	
Approach LOS		C			D			D			F	

Intersection Summary				
HCM 2000 Control Delay	52.8	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.93			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	84.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	159	719	80	238	795	137	90	649	302	173	607	112
Future Volume (vph)	159	719	80	238	795	137	90	649	302	173	607	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3413		1770	3389		1770	1827	1561	1770	1827	1554
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3413		1770	3389		1770	1827	1561	1770	1827	1554
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	159	719	80	238	795	137	90	649	302	173	607	112
RTOR Reduction (vph)	0	7	0	0	12	0	0	0	23	0	0	42
Lane Group Flow (vph)	159	792	0	238	920	0	90	649	280	173	607	70
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	11.0	31.4		17.0	37.4		8.5	43.0	60.0	12.6	47.1	58.1
Effective Green, g (s)	11.0	31.4		17.0	37.4		8.5	43.0	60.0	12.6	47.1	58.1
Actuated g/C Ratio	0.09	0.26		0.14	0.31		0.07	0.36	0.50	0.10	0.39	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	162	893		250	1056		125	654	832	185	717	804
v/s Ratio Prot	0.09	0.23		c0.13	c0.27		0.05	c0.36	0.05	c0.10	0.33	0.01
v/s Ratio Perm									0.13			0.04
v/c Ratio	0.98	0.89		0.95	0.87		0.72	0.99	0.34	0.94	0.85	0.09
Uniform Delay, d1	54.4	42.6		51.1	39.0		54.6	38.3	18.0	53.3	33.2	16.7
Progression Factor	1.00	1.00		0.65	0.86		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	64.7	12.6		38.3	8.3		15.2	33.1	0.1	47.0	9.5	0.0
Delay (s)	119.1	55.2		71.6	41.7		69.8	71.5	18.1	100.3	42.6	16.7
Level of Service	F	E		E	D		E	E	B	F	D	B
Approach Delay (s)		65.8			47.8			55.8			50.5	
Approach LOS		E			D			E			D	

Intersection Summary				
HCM 2000 Control Delay	54.7	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.96			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	94.4%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	890	18	28	948	9	0	0	0	2	1	10
Future Volume (Veh/h)	0	890	18	28	948	9	0	0	0	2	1	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	890	18	28	948	9	0	0	0	2	1	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.93			0.82			0.85	0.85	0.82	0.85	0.85	0.93
vC, conflicting volume	957			908			1440	1912	454	1454	1916	478
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	811			446			818	1372	0	834	1378	299
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	100	99	99	98
cM capacity (veh/h)	757			910			218	120	888	217	119	651

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	445	463	28	632	325	13
Volume Left	0	0	28	0	0	2
Volume Right	0	18	0	0	9	10
cSH	757	1700	910	1700	1700	394
Volume to Capacity	0.00	0.27	0.03	0.37	0.19	0.03
Queue Length 95th (ft)	0	0	2	0	0	3
Control Delay (s)	0.0	0.0	9.1	0.0	0.0	14.5
Lane LOS			A			B
Approach Delay (s)	0.0		0.3			14.5
Approach LOS						B

Intersection Summary					
Average Delay	0.2				
Intersection Capacity Utilization	36.5%	ICU Level of Service	A		
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1161	33	19	1148	30	0	0	0	0	0	22
Future Volume (Veh/h)	0	1161	33	19	1148	30	0	0	0	0	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1161	33	19	1148	30	0	0	0	0	0	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.81			0.78			0.88	0.88	0.78	0.88	0.88	0.81
vC, conflicting volume	1178			1194			1812	2394	597	1782	2395	589
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	739			687			652	1315	0	617	1316	9
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	100	100	100	97
cM capacity (veh/h)	695			705			296	134	847	321	134	863

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	580	614	19	765	413	22
Volume Left	0	0	19	0	0	0
Volume Right	0	33	0	0	30	22
cSH	695	1700	705	1700	1700	863
Volume to Capacity	0.00	0.36	0.03	0.45	0.24	0.03
Queue Length 95th (ft)	0	0	2	0	0	2
Control Delay (s)	0.0	0.0	10.2	0.0	0.0	9.3
Lane LOS			B			A
Approach Delay (s)	0.0		0.2			9.3
Approach LOS						A

Intersection Summary					
Average Delay	0.2				
Intersection Capacity Utilization	43.1%	ICU Level of Service	A		
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	589	174	141	866	54	232	210	121	44	240	40
Future Volume (vph)	50	589	174	141	866	54	232	210	121	44	240	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.95			0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3329		1770	3438		1770	1718			1789	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3329		1770	3438		1770	1718			1789	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	50	589	174	141	866	54	232	210	121	44	240	40
RTOR Reduction (vph)	0	25	0	0	4	0	0	26	0	0	0	0
Lane Group Flow (vph)	50	738	0	141	916	0	232	305	0	0	324	0
Confl. Peds. (#/hr)	1		7	7		1			2	2		
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	7.7	37.2		6.5	36.0		13.7	13.7			20.6	
Effective Green, g (s)	7.7	37.2		6.5	36.0		13.7	13.7			20.6	
Actuated g/C Ratio	0.08	0.40		0.07	0.38		0.15	0.15			0.22	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	144	1317		122	1316		257	250			392	
v/s Ratio Prot	0.03	c0.22		c0.08	c0.27		0.13	c0.18			c0.18	
v/s Ratio Perm												
v/c Ratio	0.35	0.56		1.16	0.70		0.90	1.22			0.83	
Uniform Delay, d1	40.8	22.0		43.8	24.4		39.5	40.1			35.0	
Progression Factor	0.94	0.96		1.33	1.60		1.00	1.00			1.00	
Incremental Delay, d2	0.5	1.6		114.5	2.0		31.7	128.8			13.0	
Delay (s)	38.7	22.7		172.9	41.2		71.2	168.9			48.0	
Level of Service	D	C		F	D		E	F			D	
Approach Delay (s)		23.7			58.7			128.6			48.0	
Approach LOS		C			E			F			D	

Intersection Summary				
HCM 2000 Control Delay	61.4	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	81.8%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	781	260	111	1044	122	453	319	152	60	259	80
Future Volume (vph)	68	781	260	111	1044	122	453	319	152	60	259	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.97		1.00	0.99		1.00	0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.96		1.00	0.98		1.00	0.95			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3267		1770	3405		1770	1719			1762	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3267		1770	3405		1770	1719			1762	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	68	781	260	111	1044	122	453	319	152	60	259	80
RTOR Reduction (vph)	0	27	0	0	7	0	0	14	0	0	0	0
Lane Group Flow (vph)	68	1014	0	111	1159	0	453	457	0	0	399	0
Confl. Peds. (#/hr)	7		32	32		7	18		28	28		18
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	6.0	36.0		8.4	38.4		31.2	31.2			28.4	
Effective Green, g (s)	6.0	36.0		8.4	38.4		31.2	31.2			28.4	
Actuated g/C Ratio	0.05	0.30		0.07	0.32		0.26	0.26			0.24	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	88	980		123	1089		460	446			417	
v/s Ratio Prot	0.04	c0.31		0.06	c0.34		0.26	c0.27			c0.23	
v/s Ratio Perm												
v/c Ratio	0.77	1.03		0.90	1.06		0.98	1.02			0.96	
Uniform Delay, d1	56.3	42.0		55.4	40.8		44.2	44.4			45.2	
Progression Factor	0.61	0.43		1.13	0.31		1.00	1.00			1.00	
Incremental Delay, d2	26.8	35.6		24.6	36.3		37.7	49.0			32.8	
Delay (s)	60.9	53.5		87.0	49.0		81.9	93.4			78.0	
Level of Service	E	D		F	D		F	F			E	
Approach Delay (s)		54.0			52.3			87.7			78.0	
Approach LOS		D			D			F			E	

Intersection Summary				
HCM 2000 Control Delay	64.4	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	1.05			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	100.0%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1032	285	375	890	0	0	0	0	320	0	267
Future Volume (vph)	0	1032	285	375	890	0	0	0	0	320	0	267
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1032	285	375	890	0	0	0	0	320	0	267
RTOR Reduction (vph)	0	0	101	0	0	0	0	0	0	0	0	151
Lane Group Flow (vph)	0	1032	184	375	890	0	0	0	0	0	320	116
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		44.0	44.0	16.0	64.0						22.0	22.0
Effective Green, g (s)		44.0	44.0	16.0	64.0						22.0	22.0
Actuated g/C Ratio		0.47	0.47	0.17	0.68						0.23	0.23
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1656	726	573	2409						406	363
v/s Ratio Prot		c0.29	0.12	c0.11	0.25							
v/s Ratio Perm											0.18	0.07
v/c Ratio		0.62	0.25	0.65	0.37						0.79	0.32
Uniform Delay, d1		18.8	15.1	36.4	6.4						33.8	29.8
Progression Factor		0.69	0.52	1.02	0.75						1.00	1.00
Incremental Delay, d2		1.6	0.8	2.5	0.4						9.8	2.3
Delay (s)		14.6	8.6	39.7	5.2						43.6	32.1
Level of Service		B	A	D	A						D	C
Approach Delay (s)		13.3			15.4			0.0			38.4	
Approach LOS		B			B			A			D	

Intersection Summary				
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	67.0%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1320	390	260	1275	0	0	0	0	390	0	407
Future Volume (vph)	0	1320	390	260	1275	0	0	0	0	390	0	407
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1320	390	260	1275	0	0	0	0	390	0	407
RTOR Reduction (vph)	0	0	80	0	0	0	0	0	0	0	0	71
Lane Group Flow (vph)	0	1320	310	260	1275	0	0	0	0	0	390	336
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Perm	Prot	NA					Prot	NA	Perm
Protected Phases		4		3	8					1	6	
Permitted Phases			4									6
Actuated Green, G (s)		64.8	64.8	14.2	83.0						29.0	29.0
Effective Green, g (s)		64.8	64.8	14.2	83.0						29.0	29.0
Actuated g/C Ratio		0.54	0.54	0.12	0.69						0.24	0.24
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1911	838	398	2447						419	375
v/s Ratio Prot		c0.37		c0.08	0.36							
v/s Ratio Perm			0.20								0.22	0.22
v/c Ratio		0.69	0.37	0.65	0.52						0.93	0.90
Uniform Delay, d1		20.2	15.9	50.5	8.9						44.5	44.0
Progression Factor		0.75	0.82	0.96	0.68						1.00	1.00
Incremental Delay, d2		1.6	0.9	3.5	0.7						27.3	26.3
Delay (s)		16.7	13.9	51.9	6.8						71.8	70.4
Level of Service		B	B	D	A						E	E
Approach Delay (s)		16.1			14.4			0.0			71.1	
Approach LOS		B			B			A			E	

Intersection Summary				
HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.75			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	75.5%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1181	0	0	1518	187	238
Future Volume (vph)	1181	0	0	1518	187	238
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			*0.83	0.97	0.88
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3539			4638	3367	2733
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3539			4638	3367	2733
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1181	0	0	1518	187	238
RTOR Reduction (vph)	0	0	0	0	0	179
Lane Group Flow (vph)	1181	0	0	1518	187	59
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	75.5			75.5	10.5	10.5
Effective Green, g (s)	75.5			75.5	10.5	10.5
Actuated g/C Ratio	0.80			0.80	0.11	0.11
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2842			3725	376	305
v/s Ratio Prot	c0.33			0.33		
v/s Ratio Perm					c0.06	0.02
v/c Ratio	0.42			0.41	0.50	0.19
Uniform Delay, d1	2.7			2.7	39.3	37.9
Progression Factor	0.37			1.87	1.00	1.00
Incremental Delay, d2	0.4			0.3	1.0	0.3
Delay (s)	1.4			5.3	40.3	38.2
Level of Service	A			A	D	D
Approach Delay (s)	1.4			5.3	39.1	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.43			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	47.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1354	356	0	1742	300	500
Future Volume (vph)	1354	356	0	1742	300	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		4638	3367	2733
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1354	356	0	1742	300	500
RTOR Reduction (vph)	0	86	0	0	0	92
Lane Group Flow (vph)	1354	270	0	1742	300	408
Heavy Vehicles (%)	2%	6%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	88.4	88.4		88.4	23.6	23.6
Effective Green, g (s)	88.4	88.4		88.4	23.6	23.6
Actuated g/C Ratio	0.74	0.74		0.74	0.20	0.20
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2607	1122		3416	662	537
v/s Ratio Prot	c0.38			0.38		
v/s Ratio Perm		0.18			0.09	c0.15
v/c Ratio	0.52	0.24		0.51	0.45	0.76
Uniform Delay, d1	6.7	5.1		6.7	42.5	45.5
Progression Factor	0.18	0.00		1.14	1.00	1.00
Incremental Delay, d2	0.7	0.4		0.4	0.5	6.1
Delay (s)	1.9	0.4		8.0	43.0	51.6
Level of Service	A	A		A	D	D
Approach Delay (s)	1.6			8.0	48.4	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	61.6%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

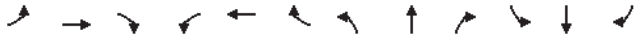
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	1	21	52	2	26	9	577	35	16	862	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.96		1.00	0.99		1.00	0.98	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1747			1725		1770	1813		1770	1800	
Flt Permitted		0.80			0.80		0.19	1.00		0.38	1.00	
Satd. Flow (perm)		1461			1428		347	1813		715	1800	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	96	1	21	52	2	26	9	577	35	16	862	110
RTOR Reduction (vph)	0	15	0	0	22	0	0	3	0	0	6	0
Lane Group Flow (vph)	0	103	0	0	58	0	9	609	0	16	966	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.9			7.9		36.9	36.9		36.9	36.9	
Effective Green, g (s)		7.9			7.9		36.9	36.9		36.9	36.9	
Actuated g/C Ratio		0.15			0.15		0.70	0.70		0.70	0.70	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		218			213		242	1267		499	1257	
v/s Ratio Prot								0.34			c0.54	
v/s Ratio Perm		c0.07			0.04		0.03			0.02		
v/c Ratio		0.47			0.27		0.04	0.48		0.03	0.77	
Uniform Delay, d1		20.5			19.9		2.5	3.6		2.4	5.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6			0.7		0.1	0.3		0.0	2.9	
Delay (s)		22.1			20.6		2.5	3.9		2.5	8.1	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		22.1			20.6			3.9			8.0	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	8.0	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	52.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	67.2%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	1	21	52	2	26	9	577	35	16	862	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.96		1.00	0.99		1.00	0.98	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1747			1725		1770	1813		1770	1800	
Flt Permitted		0.80			0.80		0.19	1.00		0.38	1.00	
Satd. Flow (perm)		1461			1428		347	1813		715	1800	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	96	1	21	52	2	26	9	577	35	16	862	110
RTOR Reduction (vph)	0	15	0	0	22	0	0	3	0	0	6	0
Lane Group Flow (vph)	0	103	0	0	58	0	9	609	0	16	966	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.9			7.9		36.9	36.9		36.9	36.9	
Effective Green, g (s)		7.9			7.9		36.9	36.9		36.9	36.9	
Actuated g/C Ratio		0.15			0.15		0.70	0.70		0.70	0.70	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		218			213		242	1267		499	1257	
v/s Ratio Prot								0.34			c0.54	
v/s Ratio Perm		c0.07			0.04		0.03			0.02		
v/c Ratio		0.47			0.27		0.04	0.48		0.03	0.77	
Uniform Delay, d1		20.5			19.9		2.5	3.6		2.4	5.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6			0.7		0.1	0.3		0.0	2.9	
Delay (s)		22.1			20.6		2.5	3.9		2.5	8.1	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		22.1			20.6			3.9			8.0	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	8.0	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	52.8	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	67.2%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/26/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1180	579	213	690	502
Future Volume (vph)	0	1180	579	213	690	502
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1180	579	213	690	502
RTOR Reduction (vph)	0	0	0	0	0	219
Lane Group Flow (vph)	0	1180	579	213	690	283
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		38.2	38.2	67.0	20.8	20.8
Effective Green, g (s)		38.2	38.2	67.0	20.8	20.8
Actuated g/C Ratio		0.57	0.57	1.00	0.31	0.31
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1941	2017	1524	1025	832
v/s Ratio Prot		c0.35	0.16			
v/s Ratio Perm				0.14	c0.21	0.11
v/c Ratio		0.61	0.29	0.14	0.67	0.34
Uniform Delay, d1		9.5	7.4	0.0	20.1	17.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.4	0.4	0.2	1.8	0.2
Delay (s)		10.9	7.8	0.2	21.9	18.1
Level of Service		B	A	A	C	B
Approach Delay (s)		10.9	5.7		20.3	
Approach LOS		B	A		C	

Intersection Summary				
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	59.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/27/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1529	565	370	360	393
Future Volume (vph)	0	1529	565	370	360	393
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1529	565	370	360	393
RTOR Reduction (vph)	0	0	0	0	0	330
Lane Group Flow (vph)	0	1529	565	370	360	63
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		66.0	66.0	88.2	14.2	14.2
Effective Green, g (s)		66.0	66.0	88.2	14.2	14.2
Actuated g/C Ratio		0.75	0.75	1.00	0.16	0.16
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2548	2648	1524	531	431
v/s Ratio Prot		c0.45	0.16			
v/s Ratio Perm				0.24	c0.11	0.02
v/c Ratio		0.60	0.21	0.24	0.68	0.15
Uniform Delay, d1		5.1	3.3	0.0	34.8	31.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.1	0.2	0.4	3.4	0.2
Delay (s)		6.1	3.5	0.4	38.3	32.0
Level of Service		A	A	A	D	C
Approach Delay (s)		6.1	2.3		35.0	
Approach LOS		A	A		C	

Intersection Summary				
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	88.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	59.2%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/26/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	959	341	0	1622	160	570
Future Volume (vph)	959	341	0	1622	160	570
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		3406	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	959	341	0	1622	160	570
RTOR Reduction (vph)	0	0	0	0	0	136
Lane Group Flow (vph)	959	341	0	1622	160	434
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	48.2	73.3		48.2	17.1	17.1
Effective Green, g (s)	48.2	73.3		48.2	17.1	17.1
Actuated g/C Ratio	0.66	1.00		0.66	0.23	0.23
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2327	1524		2239	770	625
v/s Ratio Prot	0.27			c0.48		
v/s Ratio Perm		0.22			0.05	c0.16
v/c Ratio	0.41	0.22		0.72	0.21	0.69
Uniform Delay, d1	5.9	0.0		8.2	22.6	25.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.3		2.1	0.1	3.4
Delay (s)	6.4	0.3		10.3	22.8	29.1
Level of Service	A	A		B	C	C
Approach Delay (s)	4.8			10.3	27.7	
Approach LOS	A			B	C	

Intersection Summary				
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	73.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	56.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	607	443	0	2125	210	500
Future Volume (vph)	607	443	0	2125	210	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		3406	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	607	443	0	2125	210	500
RTOR Reduction (vph)	0	0	0	0	0	429
Lane Group Flow (vph)	607	443	0	2125	210	71
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	57.1	75.9		57.1	10.8	10.8
Effective Green, g (s)	57.1	75.9		57.1	10.8	10.8
Actuated g/C Ratio	0.75	1.00		0.75	0.14	0.14
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2662	1524		2562	469	381
v/s Ratio Prot	0.17			c0.62		
v/s Ratio Perm		0.29			c0.06	0.03
v/c Ratio	0.23	0.29		0.83	0.45	0.19
Uniform Delay, d1	2.8	0.0		6.2	29.8	28.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.5		3.3	0.7	0.2
Delay (s)	3.0	0.5		9.5	30.5	28.9
Level of Service	A	A		A	C	C
Approach Delay (s)	1.9			9.5	29.4	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.77			
Actuated Cycle Length (s)	75.9	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	71.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/26/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	0	35	0	215	5	840	30	225	1054	0
Future Volume (vph)	4	0	0	35	0	215	5	840	30	225	1054	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		1.00			0.88		1.00	0.99		1.00	1.00	
Flt Protected		0.95			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1770			1593		1770	3452		1770	3471	
Flt Permitted		0.38			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		703			1535		1770	3452		1770	3471	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	0	0	35	0	215	5	840	30	225	1054	0
RTOR Reduction (vph)	0	0	0	0	181	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	4	0	0	69	0	5	868	0	225	1054	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		10.6			10.6		0.9	33.3		11.2	43.6	
Effective Green, g (s)		10.6			10.6		0.9	33.8		11.2	44.1	
Actuated g/C Ratio		0.16			0.16		0.01	0.50		0.17	0.65	
Clearance Time (s)		4.0			4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)		4.0			4.0		2.0	4.0		1.0	4.0	
Lane Grp Cap (vph)		110			240		23	1726		293	2264	
v/s Ratio Prot							0.00	c0.25		c0.13	0.30	
v/s Ratio Perm		0.01			c0.04							
v/c Ratio		0.04			0.29		0.22	0.50		0.77	0.47	
Uniform Delay, d1		24.2			25.2		33.0	11.3		27.0	5.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.9		1.7	1.0		10.4	0.2	
Delay (s)		24.4			26.1		34.7	12.3		37.3	6.1	
Level of Service		C			C		C	B		D	A	
Approach Delay (s)		24.4			26.1			12.5			11.6	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	67.6	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	61.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	3	1	79	0	405	0	1119	50	215	1038	0
Future Volume (vph)	2	3	1	79	0	405	0	1119	50	215	1038	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frpb, ped/bikes		0.99			0.98			1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		0.98			0.89			0.99		1.00	1.00	
Flt Protected		0.98			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1781			1605			3512		1770	3539	
Flt Permitted		0.89			0.95			1.00		0.95	1.00	
Satd. Flow (perm)		1618			1530			3512		1770	3539	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	3	1	79	0	405	0	1119	50	215	1038	0
RTOR Reduction (vph)	0	1	0	0	201	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	283	0	0	1166	0	215	1038	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		17.6			17.6			31.2		12.5	47.7	
Effective Green, g (s)		17.6			17.6			31.7		12.5	48.2	
Actuated g/C Ratio		0.24			0.24			0.43		0.17	0.65	
Clearance Time (s)		4.0			4.0			4.5		4.0	4.5	
Vehicle Extension (s)		2.0			2.0			4.0		1.0	4.0	
Lane Grp Cap (vph)		385			364			1508		299	2311	
v/s Ratio Prot								c0.33		c0.12	0.29	
v/s Ratio Perm		0.00			c0.18							
v/c Ratio		0.01			0.78			0.77		0.72	0.45	
Uniform Delay, d1		21.5			26.3			18.0		29.0	6.3	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.0			9.2			2.7		6.7	0.2	
Delay (s)		21.5			35.4			20.7		35.7	6.5	
Level of Service		C			D			C		D	A	
Approach Delay (s)		21.5			35.4			20.7			11.5	
Approach LOS		C			D			C			B	

Intersection Summary				
HCM 2000 Control Delay	19.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	73.8	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	87.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/26/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	96	1	21	48	2	26	9	577	26	16	862	110
Future Volume (Veh/h)	96	1	21	48	2	26	9	577	26	16	862	110
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	96	1	21	48	2	26	9	577	26	16	862	110
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.77	0.77		0.77	0.77	0.77				0.77		
vC, conflicting volume	1571	1570	917	1524	1612	590	972			603		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1592	1591	917	1530	1645	323	972			340		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	99	94	28	97	95	99			98		
cM capacity (veh/h)	61	81	330	67	75	555	709			943		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	118	76	9	603	16	972
Volume Left	96	48	9	0	16	0
Volume Right	21	26	0	26	0	110
cSH	72	96	709	1700	943	1700
Volume to Capacity	1.65	0.79	0.01	0.35	0.02	0.57
Queue Length 95th (ft)	254	106	1	0	1	0
Control Delay (s)	442.4	119.7	10.1	0.0	8.9	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	442.4	119.7	0.1		0.1	
Approach LOS	F	F				

Intersection Summary					
Average Delay	34.3				
Intersection Capacity Utilization	67.4%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	119	2	14	46	2	25	5	886	35	22	762	73
Future Volume (Veh/h)	119	2	14	46	2	25	5	886	35	22	762	73
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	119	2	14	46	2	25	5	886	35	22	762	73
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.66	0.66		0.66	0.66	0.66				0.66		
vC, conflicting volume	1764	1774	798	1734	1792	904	835			921		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1900	1914	798	1855	1943	597	835			623		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	95	96	0	95	92	99			97		
cM capacity (veh/h)	30	43	386	34	41	332	798			633		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	135	73	5	921	22	835
Volume Left	119	46	5	0	22	0
Volume Right	14	25	0	35	0	73
cSH	33	49	798	1700	633	1700
Volume to Capacity	4.06	1.49	0.01	0.54	0.03	0.49
Queue Length 95th (ft)	Err	174	0	0	3	0
Control Delay (s)	Err	437.4	9.5	0.0	10.9	0.0
Lane LOS	F	F	A		B	
Approach Delay (s)	Err	437.4	0.1		0.3	
Approach LOS	F	F				

Intersection Summary					
Average Delay	694.2				
Intersection Capacity Utilization	65.7%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/26/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	667	70	149	753	51	70	524	148	93	654	152
Future Volume (vph)	140	667	70	149	753	51	70	524	148	93	654	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3417		1770	3436		1770	1644	1561	1770	1644	1559
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3417		1770	3436		1770	1644	1561	1770	1644	1559
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	140	667	70	149	753	51	70	524	148	93	654	152
RTOR Reduction (vph)	0	8	0	0	5	0	0	0	44	0	0	36
Lane Group Flow (vph)	140	729	0	149	799	0	70	524	104	93	654	116
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Parking (#/hr)								0			0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	11.4	29.1		10.3	28.0		4.8	32.5	42.8	6.1	33.8	45.2
Effective Green, g (s)	11.4	29.1		10.3	28.0		4.8	32.5	42.8	6.1	33.8	45.2
Actuated g/C Ratio	0.12	0.31		0.11	0.30		0.05	0.35	0.46	0.06	0.36	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	214	1057		193	1023		90	568	777	114	591	815
v/s Ratio Prot	0.08	0.21		c0.08	c0.23		0.04	0.32	0.01	c0.05	c0.40	0.02
v/s Ratio Perm									0.05			0.06
v/c Ratio	0.65	0.69		0.77	0.78		0.78	0.92	0.13	0.82	1.11	0.14
Uniform Delay, d1	39.4	28.5		40.7	30.2		44.1	29.5	14.9	43.4	30.1	13.6
Progression Factor	1.00	1.00		0.86	1.25		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.4	3.7		14.9	5.5		31.0	20.9	0.0	32.9	69.7	0.0
Delay (s)	44.8	32.2		50.0	43.2		75.1	50.5	14.9	76.3	99.8	13.6
Level of Service	D	C		D	D		E	D	B	E	F	B
Approach Delay (s)		34.2			44.3			45.7			82.8	
Approach LOS		C			D			D			F	

Intersection Summary				
HCM 2000 Control Delay	52.0	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.92			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	84.1%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	159	719	80	242	795	116	90	649	302	173	604	112
Future Volume (vph)	159	719	80	242	795	116	90	649	302	173	604	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3413		1770	3400		1770	1827	1561	1770	1827	1554
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3413		1770	3400		1770	1827	1561	1770	1827	1554
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	159	719	80	242	795	116	90	649	302	173	604	112
RTOR Reduction (vph)	0	7	0	0	10	0	0	0	23	0	0	42
Lane Group Flow (vph)	159	792	0	242	901	0	90	649	280	173	604	70
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	11.0	31.4		17.0	37.4		8.5	43.0	60.0	12.6	47.1	58.1
Effective Green, g (s)	11.0	31.4		17.0	37.4		8.5	43.0	60.0	12.6	47.1	58.1
Actuated g/C Ratio	0.09	0.26		0.14	0.31		0.07	0.36	0.50	0.10	0.39	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	162	893		250	1059		125	654	832	185	717	804
v/s Ratio Prot	0.09	0.23		c0.14	c0.27		0.05	c0.36	0.05	c0.10	0.33	0.01
v/s Ratio Perm									0.13			0.04
v/c Ratio	0.98	0.89		0.97	0.85		0.72	0.99	0.34	0.94	0.84	0.09
Uniform Delay, d1	54.4	42.6		51.2	38.7		54.6	38.3	18.0	53.3	33.1	16.7
Progression Factor	1.00	1.00		0.65	0.86		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	64.7	12.6		42.1	7.2		15.2	33.1	0.1	47.0	9.2	0.0
Delay (s)	119.1	55.2		75.6	40.4		69.8	71.5	18.1	100.3	42.3	16.7
Level of Service	F	E		E	D		E	E	B	F	D	B
Approach Delay (s)		65.8			47.8			55.8			50.4	
Approach LOS		E			D			E			D	

Intersection Summary				
HCM 2000 Control Delay	54.7	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.96			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	94.6%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/26/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	890	18	28	939	18	0	0	0	2	1	14
Future Volume (Veh/h)	0	890	18	28	939	18	0	0	0	2	1	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	890	18	28	939	18	0	0	0	2	1	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.93			0.82			0.85	0.85	0.82	0.85	0.85	0.93
vC, conflicting volume	957			908			1439	1912	454	1449	1912	478
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	811			444			816	1371	0	828	1371	299
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	100	99	99	98
cM capacity (veh/h)	757			910			217	120	888	219	120	651

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	445	463	28	626	331	17
Volume Left	0	0	28	0	0	2
Volume Right	0	18	0	0	18	14
cSH	757	1700	910	1700	1700	436
Volume to Capacity	0.00	0.27	0.03	0.37	0.19	0.04
Queue Length 95th (ft)	0	0	2	0	0	3
Control Delay (s)	0.0	0.0	9.1	0.0	0.0	13.6
Lane LOS			A			B
Approach Delay (s)	0.0		0.3			13.6
Approach LOS						B

Intersection Summary					
Average Delay	0.3				
Intersection Capacity Utilization	36.5%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1161	33	19	1127	51	0	0	0	0	0	26
Future Volume (Veh/h)	0	1161	33	19	1127	51	0	0	0	0	0	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1161	33	19	1127	51	0	0	0	0	0	26
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.81			0.78			0.88	0.88	0.78	0.88	0.88	0.81
vC, conflicting volume	1178			1194			1805	2394	597	1771	2384	589
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	739			687			644	1315	0	606	1304	9
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	100	100	100	97
cM capacity (veh/h)	695			705			298	134	847	328	136	863

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	580	614	19	751	427	26
Volume Left	0	0	19	0	0	0
Volume Right	0	33	0	0	51	26
cSH	695	1700	705	1700	1700	863
Volume to Capacity	0.00	0.36	0.03	0.44	0.25	0.03
Queue Length 95th (ft)	0	0	2	0	0	2
Control Delay (s)	0.0	0.0	10.2	0.0	0.0	9.3
Lane LOS			B			A
Approach Delay (s)	0.0		0.2			9.3
Approach LOS						A

Intersection Summary					
Average Delay	0.2				
Intersection Capacity Utilization	43.1%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/26/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	589	174	141	866	54	232	210	121	44	240	40
Future Volume (vph)	50	589	174	141	866	54	232	210	121	44	240	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.95			0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3329		1770	3438		1770	1718			1789	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3329		1770	3438		1770	1718			1789	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	50	589	174	141	866	54	232	210	121	44	240	40
RTOR Reduction (vph)	0	25	0	0	4	0	0	26	0	0	0	0
Lane Group Flow (vph)	50	738	0	141	916	0	232	305	0	0	324	0
Confl. Peds. (#/hr)	1		7	7		1			2	2		
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	7.7	37.2		6.5	36.0		13.7	13.7			20.6	
Effective Green, g (s)	7.7	37.2		6.5	36.0		13.7	13.7			20.6	
Actuated g/C Ratio	0.08	0.40		0.07	0.38		0.15	0.15			0.22	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	144	1317		122	1316		257	250			392	
v/s Ratio Prot	0.03	c0.22		c0.08	c0.27		0.13	c0.18			c0.18	
v/s Ratio Perm												
v/c Ratio	0.35	0.56		1.16	0.70		0.90	1.22			0.83	
Uniform Delay, d1	40.8	22.0		43.8	24.4		39.5	40.1			35.0	
Progression Factor	0.94	0.96		1.33	1.60		1.00	1.00			1.00	
Incremental Delay, d2	0.5	1.6		114.5	2.0		31.7	128.8			13.0	
Delay (s)	38.7	22.7		172.9	41.2		71.2	168.9			48.0	
Level of Service	D	C		F	D		E	F			D	
Approach Delay (s)		23.7			58.7			128.6			48.0	
Approach LOS		C			E			F			D	

Intersection Summary				
HCM 2000 Control Delay	61.4	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	81.8%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	781	260	111	1044	122	453	319	152	60	259	80
Future Volume (vph)	68	781	260	111	1044	122	453	319	152	60	259	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.97		1.00	0.99		1.00	0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.96		1.00	0.98		1.00	0.95			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3267		1770	3405		1770	1719			1762	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3267		1770	3405		1770	1719			1762	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	68	781	260	111	1044	122	453	319	152	60	259	80
RTOR Reduction (vph)	0	27	0	0	7	0	0	14	0	0	0	0
Lane Group Flow (vph)	68	1014	0	111	1159	0	453	457	0	0	399	0
Confl. Peds. (#/hr)	7		32	32		7	18		28	28		18
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	6.0	36.0		8.4	38.4		31.2	31.2			28.4	
Effective Green, g (s)	6.0	36.0		8.4	38.4		31.2	31.2			28.4	
Actuated g/C Ratio	0.05	0.30		0.07	0.32		0.26	0.26			0.24	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	88	980		123	1089		460	446			417	
v/s Ratio Prot	0.04	c0.31		0.06	c0.34		0.26	c0.27			c0.23	
v/s Ratio Perm												
v/c Ratio	0.77	1.03		0.90	1.06		0.98	1.02			0.96	
Uniform Delay, d1	56.3	42.0		55.4	40.8		44.2	44.4			45.2	
Progression Factor	0.61	0.43		1.13	0.31		1.00	1.00			1.00	
Incremental Delay, d2	26.8	35.6		24.6	36.3		37.7	49.0			32.8	
Delay (s)	60.9	53.5		87.0	49.0		81.9	93.4			78.0	
Level of Service	E	D		F	D		F	F			E	
Approach Delay (s)		54.0			52.3			87.7			78.0	
Approach LOS		D			D			F			E	

Intersection Summary				
HCM 2000 Control Delay	64.4	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	1.05			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	100.0%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/26/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1032	285	375	890	0	0	0	0	320	0	267
Future Volume (vph)	0	1032	285	375	890	0	0	0	0	320	0	267
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1032	285	375	890	0	0	0	0	320	0	267
RTOR Reduction (vph)	0	0	101	0	0	0	0	0	0	0	0	151
Lane Group Flow (vph)	0	1032	184	375	890	0	0	0	0	0	320	116
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		44.0	44.0	16.0	64.0						22.0	22.0
Effective Green, g (s)		44.0	44.0	16.0	64.0						22.0	22.0
Actuated g/C Ratio		0.47	0.47	0.17	0.68						0.23	0.23
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1656	726	573	2409						406	363
v/s Ratio Prot		c0.29	0.12	c0.11	0.25							
v/s Ratio Perm											0.18	0.07
v/c Ratio		0.62	0.25	0.65	0.37						0.79	0.32
Uniform Delay, d1		18.8	15.1	36.4	6.4						33.8	29.8
Progression Factor		0.69	0.52	1.02	0.75						1.00	1.00
Incremental Delay, d2		1.6	0.8	2.5	0.4						9.8	2.3
Delay (s)		14.6	8.6	39.7	5.2						43.6	32.1
Level of Service		B	A	D	A						D	C
Approach Delay (s)		13.3			15.4			0.0			38.4	
Approach LOS		B			B			A			D	

Intersection Summary				
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	67.0%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1320	390	260	1275	0	0	0	0	390	0	407
Future Volume (vph)	0	1320	390	260	1275	0	0	0	0	390	0	407
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1320	390	260	1275	0	0	0	0	390	0	407
RTOR Reduction (vph)	0	0	80	0	0	0	0	0	0	0	0	71
Lane Group Flow (vph)	0	1320	310	260	1275	0	0	0	0	0	390	336
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Perm	Prot	NA					Prot	NA	Perm
Protected Phases		4		3	8					1	6	
Permitted Phases			4									6
Actuated Green, G (s)		64.8	64.8	14.2	83.0						29.0	29.0
Effective Green, g (s)		64.8	64.8	14.2	83.0						29.0	29.0
Actuated g/C Ratio		0.54	0.54	0.12	0.69						0.24	0.24
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1911	838	398	2447						419	375
v/s Ratio Prot		c0.37		c0.08	0.36							
v/s Ratio Perm			0.20								0.22	0.22
v/c Ratio		0.69	0.37	0.65	0.52						0.93	0.90
Uniform Delay, d1		20.2	15.9	50.5	8.9						44.5	44.0
Progression Factor		0.75	0.82	0.96	0.68						1.00	1.00
Incremental Delay, d2		1.6	0.9	3.5	0.7						27.3	26.3
Delay (s)		16.7	13.9	51.9	6.8						71.8	70.4
Level of Service		B	B	D	A						E	E
Approach Delay (s)		16.1			14.4			0.0			71.1	
Approach LOS		B			B			A			E	

Intersection Summary				
HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.75			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	75.5%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/26/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1181	0	0	1518	187	238
Future Volume (vph)	1181	0	0	1518	187	238
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			*0.83	0.97	0.88
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3539			4638	3367	2733
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3539			4638	3367	2733
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1181	0	0	1518	187	238
RTOR Reduction (vph)	0	0	0	0	0	179
Lane Group Flow (vph)	1181	0	0	1518	187	59
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	75.5			75.5	10.5	10.5
Effective Green, g (s)	75.5			75.5	10.5	10.5
Actuated g/C Ratio	0.80			0.80	0.11	0.11
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2842			3725	376	305
v/s Ratio Prot	c0.33			0.33		
v/s Ratio Perm					c0.06	0.02
v/c Ratio	0.42			0.41	0.50	0.19
Uniform Delay, d1	2.7			2.7	39.3	37.9
Progression Factor	0.37			1.87	1.00	1.00
Incremental Delay, d2	0.4			0.3	1.0	0.3
Delay (s)	1.4			5.3	40.3	38.2
Level of Service	A			A	D	D
Approach Delay (s)	1.4			5.3	39.1	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.43			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	47.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/27/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1354	356	0	1742	300	500
Future Volume (vph)	1354	356	0	1742	300	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		4638	3367	2733
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1354	356	0	1742	300	500
RTOR Reduction (vph)	0	86	0	0	0	92
Lane Group Flow (vph)	1354	270	0	1742	300	408
Heavy Vehicles (%)	2%	6%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	88.4	88.4		88.4	23.6	23.6
Effective Green, g (s)	88.4	88.4		88.4	23.6	23.6
Actuated g/C Ratio	0.74	0.74		0.74	0.20	0.20
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2607	1122		3416	662	537
v/s Ratio Prot	c0.38			0.38		
v/s Ratio Perm		0.18			0.09	c0.15
v/c Ratio	0.52	0.24		0.51	0.45	0.76
Uniform Delay, d1	6.7	5.1		6.7	42.5	45.5
Progression Factor	0.18	0.00		1.14	1.00	1.00
Incremental Delay, d2	0.7	0.4		0.4	0.5	6.1
Delay (s)	1.9	0.4		8.0	43.0	51.6
Level of Service	A	A		A	D	D
Approach Delay (s)	1.6			8.0	48.4	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	61.6%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	1	21	48	2	26	9	577	26	16	862	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.95		1.00	0.99		1.00	0.98	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1747			1722		1770	1817		1770	1800	
Flt Permitted		0.80			0.81		0.19	1.00		0.39	1.00	
Satd. Flow (perm)		1463			1432		348	1817		725	1800	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	96	1	21	48	2	26	9	577	26	16	862	110
RTOR Reduction (vph)	0	15	0	0	22	0	0	2	0	0	6	0
Lane Group Flow (vph)	0	103	0	0	54	0	9	601	0	16	966	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.9			7.9		37.1	37.1		37.1	37.1	
Effective Green, g (s)		7.9			7.9		37.1	37.1		37.1	37.1	
Actuated g/C Ratio		0.15			0.15		0.70	0.70		0.70	0.70	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		218			213		243	1271		507	1260	
v/s Ratio Prot								0.33			c0.54	
v/s Ratio Perm		c0.07			0.04		0.03			0.02		
v/c Ratio		0.47			0.25		0.04	0.47		0.03	0.77	
Uniform Delay, d1		20.6			19.9		2.4	3.6		2.4	5.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6			0.6		0.1	0.3		0.0	2.9	
Delay (s)		22.2			20.6		2.5	3.8		2.5	8.0	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		22.2			20.6			3.8			7.9	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	8.0	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	53.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	67.4%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/27/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	1	21	48	2	26	9	577	26	16	862	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.95		1.00	0.99		1.00	0.98	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1747			1722		1770	1817		1770	1800	
Flt Permitted		0.80			0.81		0.19	1.00		0.39	1.00	
Satd. Flow (perm)		1463			1432		348	1817		725	1800	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	96	1	21	48	2	26	9	577	26	16	862	110
RTOR Reduction (vph)	0	15	0	0	22	0	0	2	0	0	6	0
Lane Group Flow (vph)	0	103	0	0	54	0	9	601	0	16	966	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.9			7.9		37.1	37.1		37.1	37.1	
Effective Green, g (s)		7.9			7.9		37.1	37.1		37.1	37.1	
Actuated g/C Ratio		0.15			0.15		0.70	0.70		0.70	0.70	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		218			213		243	1271		507	1260	
v/s Ratio Prot								0.33			c0.54	
v/s Ratio Perm		c0.07			0.04		0.03			0.02		
v/c Ratio		0.47			0.25		0.04	0.47		0.03	0.77	
Uniform Delay, d1		20.6			19.9		2.4	3.6		2.4	5.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6			0.6		0.1	0.3		0.0	2.9	
Delay (s)		22.2			20.6		2.5	3.8		2.5	8.0	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		22.2			20.6			3.8			7.9	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	8.0	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	53.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	67.4%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/29/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1180	579	213	690	502
Future Volume (vph)	0	1180	579	213	690	502
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1180	579	213	690	502
RTOR Reduction (vph)	0	0	0	0	0	219
Lane Group Flow (vph)	0	1180	579	213	690	283
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		38.2	38.2	67.0	20.8	20.8
Effective Green, g (s)		38.2	38.2	67.0	20.8	20.8
Actuated g/C Ratio		0.57	0.57	1.00	0.31	0.31
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1941	2017	1524	1025	832
v/s Ratio Prot		c0.35	0.16			
v/s Ratio Perm				0.14	c0.21	0.11
v/c Ratio		0.61	0.29	0.14	0.67	0.34
Uniform Delay, d1		9.5	7.4	0.0	20.1	17.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.4	0.4	0.2	1.8	0.2
Delay (s)		10.9	7.8	0.2	21.9	18.1
Level of Service		B	A	A	C	B
Approach Delay (s)		10.9	5.7		20.3	
Approach LOS		B	A		C	

Intersection Summary				
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	59.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: Old Redwood Hwy & US 101 Southbound Ramps

9/29/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1529	565	370	360	393
Future Volume (vph)	0	1529	565	370	360	393
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	0.95	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		3406	3539	1524	3303	2682
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		3406	3539	1524	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1529	565	370	360	393
RTOR Reduction (vph)	0	0	0	0	0	330
Lane Group Flow (vph)	0	1529	565	370	360	63
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type		NA	NA	Free	Perm	Perm
Protected Phases		2	6			
Permitted Phases				Free	4	4
Actuated Green, G (s)		66.0	66.0	88.2	14.2	14.2
Effective Green, g (s)		66.0	66.0	88.2	14.2	14.2
Actuated g/C Ratio		0.75	0.75	1.00	0.16	0.16
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2548	2648	1524	531	431
v/s Ratio Prot		c0.45	0.16			
v/s Ratio Perm				0.24	c0.11	0.02
v/c Ratio		0.60	0.21	0.24	0.68	0.15
Uniform Delay, d1		5.1	3.3	0.0	34.8	31.8
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.1	0.2	0.4	3.4	0.2
Delay (s)		6.1	3.5	0.4	38.3	32.0
Level of Service		A	A	A	D	C
Approach Delay (s)		6.1	2.3		35.0	
Approach LOS		A	A		C	

Intersection Summary				
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	88.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	59.2%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/29/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	959	341	0	1622	160	570
Future Volume (vph)	959	341	0	1622	160	570
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		3406	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	959	341	0	1622	160	570
RTOR Reduction (vph)	0	0	0	0	0	136
Lane Group Flow (vph)	959	341	0	1622	160	434
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	48.2	73.3		48.2	17.1	17.1
Effective Green, g (s)	48.2	73.3		48.2	17.1	17.1
Actuated g/C Ratio	0.66	1.00		0.66	0.23	0.23
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2327	1524		2239	770	625
v/s Ratio Prot	0.27			c0.48		
v/s Ratio Perm		0.22			0.05	c0.16
v/c Ratio	0.41	0.22		0.72	0.21	0.69
Uniform Delay, d1	5.9	0.0		8.2	22.6	25.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.3		2.1	0.1	3.4
Delay (s)	6.4	0.3		10.3	22.8	29.1
Level of Service	A	A		B	C	C
Approach Delay (s)	4.8			10.3	27.7	
Approach LOS	A			B	C	

Intersection Summary				
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	73.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	56.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: US 101 Northbound Ramps & Old Redwood Hwy

9/29/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	607	443	0	2125	210	500
Future Volume (vph)	607	443	0	2125	210	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		3406	3303	2682
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		3406	3303	2682
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	607	443	0	2125	210	500
RTOR Reduction (vph)	0	0	0	0	0	429
Lane Group Flow (vph)	607	443	0	2125	210	71
Heavy Vehicles (%)	2%	6%	2%	6%	6%	6%
Turn Type	NA	Free		NA	Perm	Perm
Protected Phases	2			6		
Permitted Phases		Free			8	8
Actuated Green, G (s)	57.1	75.9		57.1	10.8	10.8
Effective Green, g (s)	57.1	75.9		57.1	10.8	10.8
Actuated g/C Ratio	0.75	1.00		0.75	0.14	0.14
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2662	1524		2562	469	381
v/s Ratio Prot	0.17			c0.62		
v/s Ratio Perm		0.29			c0.06	0.03
v/c Ratio	0.23	0.29		0.83	0.45	0.19
Uniform Delay, d1	2.8	0.0		6.2	29.8	28.7
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.5		3.3	0.7	0.2
Delay (s)	3.0	0.5		9.5	30.5	28.9
Level of Service	A	A		A	C	C
Approach Delay (s)	1.9			9.5	29.4	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.77			
Actuated Cycle Length (s)	75.9	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	71.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	0	35	0	215	5	840	30	227	1052	0
Future Volume (vph)	4	0	0	35	0	215	5	840	30	227	1052	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		1.00			0.88		1.00	0.99		1.00	1.00	
Flt Protected		0.95			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1770			1593		1770	3452		1770	3471	
Flt Permitted		0.38			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		703			1534		1770	3452		1770	3471	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	0	0	35	0	215	5	840	30	227	1052	0
RTOR Reduction (vph)	0	0	0	0	181	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	4	0	0	69	0	5	867	0	227	1052	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		10.6			10.6		0.9	33.3		11.3	43.7	
Effective Green, g (s)		10.6			10.6		0.9	33.8		11.3	44.2	
Actuated g/C Ratio		0.16			0.16		0.01	0.50		0.17	0.65	
Clearance Time (s)		4.0			4.0		4.0	4.5		4.0	4.5	
Vehicle Extension (s)		4.0			4.0		2.0	4.0		1.0	4.0	
Lane Grp Cap (vph)		110			240		23	1723		295	2266	
v/s Ratio Prot							0.00	c0.25		c0.13	0.30	
v/s Ratio Perm		0.01			c0.04							
v/c Ratio		0.04			0.29		0.22	0.50		0.77	0.46	
Uniform Delay, d1		24.2			25.2		33.1	11.3		27.0	5.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.9		1.7	1.1		10.4	0.2	
Delay (s)		24.4			26.1		34.8	12.4		37.3	6.1	
Level of Service		C			C		C	B		D	A	
Approach Delay (s)		24.4			26.1			12.5			11.6	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	67.7	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	61.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Petaluma Blvd N & Driveway/Lakeville St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	3	1	79	0	405	0	1119	50	219	1034	0
Future Volume (vph)	2	3	1	79	0	405	0	1119	50	219	1034	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frpb, ped/bikes		0.99			0.98			1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	
Frt		0.98			0.89			0.99		1.00	1.00	
Flt Protected		0.98			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1781			1605			3512		1770	3539	
Flt Permitted		0.89			0.95			1.00		0.95	1.00	
Satd. Flow (perm)		1615			1530			3512		1770	3539	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	3	1	79	0	405	0	1119	50	219	1034	0
RTOR Reduction (vph)	0	1	0	0	201	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	283	0	0	1166	0	219	1034	0
Confl. Peds. (#/hr)			11	11					4	4		
Confl. Bikes (#/hr)			7			11			3			3
Heavy Vehicles (%)	2%	2%	2%	2%	4%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		17.6			17.6			31.2		12.7	47.9	
Effective Green, g (s)		17.6			17.6			31.7		12.7	48.4	
Actuated g/C Ratio		0.24			0.24			0.43		0.17	0.65	
Clearance Time (s)		4.0			4.0			4.5		4.0	4.5	
Vehicle Extension (s)		2.0			2.0			4.0		1.0	4.0	
Lane Grp Cap (vph)		384			363			1504		303	2314	
v/s Ratio Prot								c0.33		c0.12	0.29	
v/s Ratio Perm		0.00			c0.18							
v/c Ratio		0.01			0.78			0.77		0.72	0.45	
Uniform Delay, d1		21.6			26.4			18.1		29.0	6.3	
Progression Factor		1.00			1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.0			9.3			2.7		7.0	0.2	
Delay (s)		21.6			35.7			20.8		36.0	6.4	
Level of Service		C			D			C		D	A	
Approach Delay (s)		21.6			35.7			20.8			11.6	
Approach LOS		C			D			C			B	

Intersection Summary				
HCM 2000 Control Delay	19.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	87.3%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	96	1	21	41	2	26	9	577	26	14	862	110
Future Volume (Veh/h)	96	1	21	41	2	26	9	577	26	14	862	110
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	96	1	21	41	2	26	9	577	26	14	862	110
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.77	0.77		0.77	0.77	0.77				0.77		
vC, conflicting volume	1567	1566	917	1520	1608	590	972			603		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1587	1585	917	1525	1640	323	972			340		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	99	94	39	97	95	99			99		
cM capacity (veh/h)	62	81	330	68	75	555	709			943		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	118	69	9	603	14	972
Volume Left	96	41	9	0	14	0
Volume Right	21	26	0	26	0	110
cSH	72	102	709	1700	943	1700
Volume to Capacity	1.63	0.68	0.01	0.35	0.01	0.57
Queue Length 95th (ft)	252	86	1	0	1	0
Control Delay (s)	434.8	94.9	10.1	0.0	8.9	0.0
Lane LOS	F	F	B		A	
Approach Delay (s)	434.8	94.9	0.1		0.1	
Approach LOS	F	F				

Intersection Summary					
Average Delay	32.5				
Intersection Capacity Utilization	67.8%	ICU Level of Service	C		
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	119	2	14	40	2	25	5	886	35	18	762	73
Future Volume (Veh/h)	119	2	14	40	2	25	5	886	35	18	762	73
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	119	2	14	40	2	25	5	886	35	18	762	73
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1301			633	
pX, platoon unblocked	0.66	0.66		0.66	0.66	0.66				0.66		
vC, conflicting volume	1756	1766	798	1726	1784	904	835			921		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1888	1902	798	1843	1931	597	835			623		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	95	96	0	95	92	99			97		
cM capacity (veh/h)	31	44	386	34	42	332	798			633		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	135	67	5	921	18	835
Volume Left	119	40	5	0	18	0
Volume Right	14	25	0	35	0	73
cSH	34	52	798	1700	633	1700
Volume to Capacity	3.96	1.28	0.01	0.54	0.03	0.49
Queue Length 95th (ft)	Err	150	0	0	2	0
Control Delay (s)	Err	346.8	9.5	0.0	10.9	0.0
Lane LOS	F	F	A		B	
Approach Delay (s)	Err	346.8	0.1		0.2	
Approach LOS	F	F				

Intersection Summary					
Average Delay	693.3				
Intersection Capacity Utilization	66.1%	ICU Level of Service	C		
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	667	70	149	753	51	70	524	148	86	654	152
Future Volume (vph)	140	667	70	149	753	51	70	524	148	86	654	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3417		1770	3436		1770	1644	1561	1770	1644	1559
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3417		1770	3436		1770	1644	1561	1770	1644	1559
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	140	667	70	149	753	51	70	524	148	86	654	152
RTOR Reduction (vph)	0	8	0	0	5	0	0	0	46	0	0	36
Lane Group Flow (vph)	140	729	0	149	799	0	70	524	102	86	654	116
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Parking (#/hr)								0			0	
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	11.4	29.1		10.3	28.0		4.8	32.6	42.9	6.0	33.8	45.2
Effective Green, g (s)	11.4	29.1		10.3	28.0		4.8	32.6	42.9	6.0	33.8	45.2
Actuated g/C Ratio	0.12	0.31		0.11	0.30		0.05	0.35	0.46	0.06	0.36	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	214	1057		193	1023		90	570	778	112	591	815
v/s Ratio Prot	0.08	0.21		c0.08	c0.23		0.04	0.32	0.01	c0.05	c0.40	0.02
v/s Ratio Perm									0.05			0.06
v/c Ratio	0.65	0.69		0.77	0.78		0.78	0.92	0.13	0.77	1.11	0.14
Uniform Delay, d1	39.4	28.5		40.7	30.2		44.1	29.4	14.8	43.3	30.1	13.6
Progression Factor	1.00	1.00		0.86	1.25		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.4	3.7		14.9	5.5		31.0	20.2	0.0	24.2	69.7	0.0
Delay (s)	44.8	32.2		50.0	43.3		75.1	49.6	14.8	67.5	99.8	13.6
Level of Service	D	C		D	D		E	D	B	E	F	B
Approach Delay (s)		34.2			44.3			45.1			82.0	
Approach LOS		C			D			D			F	

Intersection Summary				
HCM 2000 Control Delay	51.6	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.92			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	84.1%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
5: Petaluma Blvd N & Washington St/E Washington St 9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	159	719	80	242	795	116	90	649	302	166	604	112
Future Volume (vph)	159	719	80	242	795	116	90	649	302	166	604	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3413		1770	3400		1770	1827	1561	1770	1827	1554
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3413		1770	3400		1770	1827	1561	1770	1827	1554
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	159	719	80	242	795	116	90	649	302	166	604	112
RTOR Reduction (vph)	0	7	0	0	10	0	0	0	23	0	0	42
Lane Group Flow (vph)	159	792	0	242	901	0	90	649	279	166	604	70
Confl. Peds. (#/hr)	5		8	8		5	9		7	7		9
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases									8			4
Actuated Green, G (s)	11.0	31.4		17.0	37.4		8.5	43.5	60.5	12.1	47.1	58.1
Effective Green, g (s)	11.0	31.4		17.0	37.4		8.5	43.5	60.5	12.1	47.1	58.1
Actuated g/C Ratio	0.09	0.26		0.14	0.31		0.07	0.36	0.50	0.10	0.39	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	4.0	2.0	2.0	4.0	2.0
Lane Grp Cap (vph)	162	893		250	1059		125	662	839	178	717	804
v/s Ratio Prot	0.09	0.23		c0.14	c0.27		0.05	c0.36	0.05	c0.09	c0.33	0.01
v/s Ratio Perm									0.13			0.04
v/c Ratio	0.98	0.89		0.97	0.85		0.72	0.98	0.33	0.93	0.84	0.09
Uniform Delay, d1	54.4	42.6		51.2	38.7		54.6	37.8	17.7	53.5	33.1	16.7
Progression Factor	1.00	1.00		0.65	0.86		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	64.7	12.6		42.1	7.2		15.2	30.0	0.1	47.6	9.2	0.0
Delay (s)	119.1	55.2		75.6	40.3		69.8	67.8	17.8	101.1	42.3	16.7
Level of Service	F	E		E	D		E	E	B	F	D	B
Approach Delay (s)		65.8			47.7			53.5			50.1	
Approach LOS		E			D			D			D	

Intersection Summary				
HCM 2000 Control Delay	54.0	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.94			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	94.3%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	883	18	28	939	18	0	0	0	2	1	14
Future Volume (Veh/h)	0	883	18	28	939	18	0	0	0	2	1	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	883	18	28	939	18	0	0	0	2	1	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.93			0.82			0.85	0.85	0.82	0.85	0.85	0.93
vC, conflicting volume	957			901			1432	1905	450	1446	1905	478
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	811			436			808	1363	0	824	1363	299
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	100	99	99	98
cM capacity (veh/h)	757			917			220	121	888	221	121	651

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	442	460	28	626	331	17
Volume Left	0	0	28	0	0	2
Volume Right	0	18	0	0	18	14
cSH	757	1700	917	1700	1700	438
Volume to Capacity	0.00	0.27	0.03	0.37	0.19	0.04
Queue Length 95th (ft)	0	0	2	0	0	3
Control Delay (s)	0.0	0.0	9.0	0.0	0.0	13.6
Lane LOS			A			B
Approach Delay (s)	0.0		0.3			13.6
Approach LOS						B

Intersection Summary					
Average Delay	0.3				
Intersection Capacity Utilization	36.5%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
6: Water St/N Water St & E Washington St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1154	33	19	1127	51	0	0	0	0	0	26
Future Volume (Veh/h)	0	1154	33	19	1127	51	0	0	0	0	0	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1154	33	19	1127	51	0	0	0	0	0	26
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		186			1062							
pX, platoon unblocked	0.81			0.78			0.88	0.88	0.78	0.88	0.88	0.81
vC, conflicting volume	1178			1187			1798	2386	594	1768	2378	589
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	739			678			636	1307	0	602	1296	9
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	100	100	100	97
cM capacity (veh/h)	695			710			302	135	847	330	137	863

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	577	610	19	751	427	26
Volume Left	0	0	19	0	0	0
Volume Right	0	33	0	0	51	26
cSH	695	1700	710	1700	1700	863
Volume to Capacity	0.00	0.36	0.03	0.44	0.25	0.03
Queue Length 95th (ft)	0	0	2	0	0	2
Control Delay (s)	0.0	0.0	10.2	0.0	0.0	9.3
Lane LOS			B			A
Approach Delay (s)	0.0		0.2			9.3
Approach LOS						A

Intersection Summary					
Average Delay	0.2				
Intersection Capacity Utilization	42.9%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	582	174	141	866	54	232	210	121	51	240	40
Future Volume (vph)	50	582	174	141	866	54	232	210	121	51	240	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.95			0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3328		1770	3438		1770	1718			1789	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3328		1770	3438		1770	1718			1789	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	50	582	174	141	866	54	232	210	121	51	240	40
RTOR Reduction (vph)	0	26	0	0	4	0	0	26	0	0	0	0
Lane Group Flow (vph)	50	730	0	141	916	0	232	305	0	0	331	0
Confl. Peds. (#/hr)	1		7	7		1			2	2		
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	7.6	37.1		6.3	35.8		13.7	13.7			20.9	
Effective Green, g (s)	7.6	37.1		6.3	35.8		13.7	13.7			20.9	
Actuated g/C Ratio	0.08	0.39		0.07	0.38		0.15	0.15			0.22	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	143	1313		118	1309		257	250			397	
v/s Ratio Prot	0.03	c0.22		c0.08	c0.27		0.13	c0.18			c0.19	
v/s Ratio Perm												
v/c Ratio	0.35	0.56		1.19	0.70		0.90	1.22			0.83	
Uniform Delay, d1	40.9	22.1		43.9	24.6		39.5	40.1			34.9	
Progression Factor	0.94	0.97		1.35	1.60		1.00	1.00			1.00	
Incremental Delay, d2	0.5	1.6		129.7	2.1		31.7	128.8			13.7	
Delay (s)	39.0	22.9		188.9	41.3		71.2	168.9			48.6	
Level of Service	D	C		F	D		E	F			D	
Approach Delay (s)		23.9			60.9			128.6			48.6	
Approach LOS		C			E			F			D	

Intersection Summary				
HCM 2000 Control Delay	62.5	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	0.86			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	82.2%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
7: Lakeville St & E Washington St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	774	260	111	1044	122	453	319	152	66	259	80
Future Volume (vph)	68	774	260	111	1044	122	453	319	152	66	259	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.97		1.00	0.99		1.00	0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.96		1.00	0.98		1.00	0.95			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1770	3265		1770	3404		1770	1719			1762	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (perm)	1770	3265		1770	3404		1770	1719			1762	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	68	774	260	111	1044	122	453	319	152	66	259	80
RTOR Reduction (vph)	0	27	0	0	8	0	0	14	0	0	0	0
Lane Group Flow (vph)	68	1007	0	111	1158	0	453	457	0	0	405	0
Confl. Peds. (#/hr)	7		32	32		7	18		28	28		18
Confl. Bikes (#/hr)			20			12			13			8
Heavy Vehicles (%)	2%	4%	2%	2%	4%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases												
Actuated Green, G (s)	6.0	35.8		8.3	38.1		31.2	31.2			28.7	
Effective Green, g (s)	6.0	35.8		8.3	38.1		31.2	31.2			28.7	
Actuated g/C Ratio	0.05	0.30		0.07	0.32		0.26	0.26			0.24	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5			2.5	
Lane Grp Cap (vph)	88	974		122	1080		460	446			421	
v/s Ratio Prot	0.04	c0.31		0.06	c0.34		0.26	c0.27			c0.23	
v/s Ratio Perm												
v/c Ratio	0.77	1.03		0.91	1.07		0.98	1.02			0.96	
Uniform Delay, d1	56.3	42.1		55.5	41.0		44.2	44.4			45.1	
Progression Factor	0.60	0.43		1.13	0.32		1.00	1.00			1.00	
Incremental Delay, d2	26.9	35.5		25.8	39.7		37.7	49.0			33.9	
Delay (s)	60.9	53.4		88.4	52.6		81.9	93.4			79.1	
Level of Service	E	D		F	D		F	F			E	
Approach Delay (s)		53.8			55.7			87.7			79.1	
Approach LOS		D			E			F			E	

Intersection Summary				
HCM 2000 Control Delay	65.7	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	1.05			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	100.0%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1032	285	375	890	0	0	0	0	320	0	267
Future Volume (vph)	0	1032	285	375	890	0	0	0	0	320	0	267
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1032	285	375	890	0	0	0	0	320	0	267
RTOR Reduction (vph)	0	0	101	0	0	0	0	0	0	0	0	151
Lane Group Flow (vph)	0	1032	184	375	890	0	0	0	0	0	320	116
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Prot	Prot	NA					Prot	NA	Perm
Protected Phases		4	4	3	8					1	6	
Permitted Phases												6
Actuated Green, G (s)		44.0	44.0	16.0	64.0						22.0	22.0
Effective Green, g (s)		44.0	44.0	16.0	64.0						22.0	22.0
Actuated g/C Ratio		0.47	0.47	0.17	0.68						0.23	0.23
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1656	726	573	2409						406	363
v/s Ratio Prot		c0.29	0.12	c0.11	0.25							
v/s Ratio Perm											0.18	0.07
v/c Ratio		0.62	0.25	0.65	0.37						0.79	0.32
Uniform Delay, d1		18.8	15.1	36.4	6.4						33.8	29.8
Progression Factor		0.69	0.52	1.02	0.75						1.00	1.00
Incremental Delay, d2		1.6	0.8	2.5	0.4						9.8	2.3
Delay (s)		14.6	8.6	39.7	5.2						43.6	32.1
Level of Service		B	A	D	A						D	C
Approach Delay (s)		13.3			15.4			0.0			38.4	
Approach LOS		B			B			A			D	

Intersection Summary				
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	67.0%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
8: US 101 Southbound Ramps & E Washington St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1320	390	260	1275	0	0	0	0	390	0	407
Future Volume (vph)	0	1320	390	260	1275	0	0	0	0	390	0	407
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	0.97	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1553	3367	3539						1736	1553
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1553	3367	3539						1736	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1320	390	260	1275	0	0	0	0	390	0	407
RTOR Reduction (vph)	0	0	80	0	0	0	0	0	0	0	0	71
Lane Group Flow (vph)	0	1320	310	260	1275	0	0	0	0	0	390	336
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%	2%	2%	2%	4%	2%	4%
Turn Type		NA	Perm	Prot	NA					Prot	NA	Perm
Protected Phases		4		3	8					1	6	
Permitted Phases			4									6
Actuated Green, G (s)		64.8	64.8	14.2	83.0						29.0	29.0
Effective Green, g (s)		64.8	64.8	14.2	83.0						29.0	29.0
Actuated g/C Ratio		0.54	0.54	0.12	0.69						0.24	0.24
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1911	838	398	2447						419	375
v/s Ratio Prot		c0.37		c0.08	0.36							
v/s Ratio Perm			0.20								0.22	0.22
v/c Ratio		0.69	0.37	0.65	0.52						0.93	0.90
Uniform Delay, d1		20.2	15.9	50.5	8.9						44.5	44.0
Progression Factor		0.75	0.82	0.96	0.68						1.00	1.00
Incremental Delay, d2		1.6	0.9	3.5	0.7						27.3	26.3
Delay (s)		16.7	14.0	51.9	6.8						71.8	70.4
Level of Service		B	B	D	A						E	E
Approach Delay (s)		16.1			14.4			0.0			71.1	
Approach LOS		B			B			A			E	

Intersection Summary				
HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.75			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	75.5%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/29/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1181	0	0	1518	187	238
Future Volume (vph)	1181	0	0	1518	187	238
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			*0.83	0.97	0.88
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3539			4638	3367	2733
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3539			4638	3367	2733
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1181	0	0	1518	187	238
RTOR Reduction (vph)	0	0	0	0	0	179
Lane Group Flow (vph)	1181	0	0	1518	187	59
Heavy Vehicles (%)	2%	2%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	75.5			75.5	10.5	10.5
Effective Green, g (s)	75.5			75.5	10.5	10.5
Actuated g/C Ratio	0.80			0.80	0.11	0.11
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2842			3725	376	305
v/s Ratio Prot	c0.33			0.33		
v/s Ratio Perm					c0.06	0.02
v/c Ratio	0.42			0.41	0.50	0.19
Uniform Delay, d1	2.7			2.7	39.3	37.9
Progression Factor	0.37			1.87	1.00	1.00
Incremental Delay, d2	0.4			0.3	1.0	0.3
Delay (s)	1.4			5.3	40.3	38.2
Level of Service	A			A	D	D
Approach Delay (s)	1.4			5.3	39.1	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.43			
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	47.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
9: US 101 Northbound Ramps & E Washington St

9/29/2016

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1354	356	0	1742	300	500
Future Volume (vph)	1354	356	0	1742	300	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.95	1.00		*0.83	0.97	0.88
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	3539	1524		4638	3367	2733
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	3539	1524		4638	3367	2733
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1354	356	0	1742	300	500
RTOR Reduction (vph)	0	86	0	0	0	92
Lane Group Flow (vph)	1354	270	0	1742	300	408
Heavy Vehicles (%)	2%	6%	2%	2%	4%	4%
Turn Type	NA	Perm		NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4			2	2
Actuated Green, G (s)	88.4	88.4		88.4	23.6	23.6
Effective Green, g (s)	88.4	88.4		88.4	23.6	23.6
Actuated g/C Ratio	0.74	0.74		0.74	0.20	0.20
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	2607	1122		3416	662	537
v/s Ratio Prot	c0.38			0.38		
v/s Ratio Perm		0.18			0.09	c0.15
v/c Ratio	0.52	0.24		0.51	0.45	0.76
Uniform Delay, d1	6.7	5.1		6.7	42.5	45.5
Progression Factor	0.18	0.00		1.14	1.00	1.00
Incremental Delay, d2	0.7	0.4		0.4	0.5	6.1
Delay (s)	1.9	0.4		8.0	43.0	51.6
Level of Service	A	A		A	D	D
Approach Delay (s)	1.6			8.0	48.4	
Approach LOS	A			A	D	

Intersection Summary				
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	61.6%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	96	1	21	41	2	26	9	577	26	14	862	110
Future Volume (vph)	96	1	21	41	2	26	9	577	26	14	862	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.95		1.00	0.99		1.00	0.98	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1747			1717		1770	1817		1770	1800	
Flt Permitted		0.79			0.82		0.19	1.00		0.39	1.00	
Satd. Flow (perm)		1436			1452		350	1817		726	1800	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	96	1	21	41	2	26	9	577	26	14	862	110
RTOR Reduction (vph)	0	15	0	0	22	0	0	2	0	0	6	0
Lane Group Flow (vph)	0	103	0	0	47	0	9	601	0	14	966	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.9			7.9		37.4	37.4		37.4	37.4	
Effective Green, g (s)		7.9			7.9		37.4	37.4		37.4	37.4	
Actuated g/C Ratio		0.15			0.15		0.70	0.70		0.70	0.70	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		212			215		245	1274		509	1263	
v/s Ratio Prot								0.33			c0.54	
v/s Ratio Perm		c0.07			0.03		0.03			0.02		
v/c Ratio		0.48			0.22		0.04	0.47		0.03	0.77	
Uniform Delay, d1		20.8			20.0		2.4	3.5		2.4	5.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.7			0.5		0.1	0.3		0.0	2.8	
Delay (s)		22.6			20.5		2.5	3.8		2.4	7.9	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		22.6			20.5			3.8			7.9	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	7.9	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	53.3	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	67.8%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Petaluma Blvd N & Oak St

9/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	2	14	40	2	25	5	886	35	18	762	73
Future Volume (vph)	119	2	14	40	2	25	5	886	35	18	762	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.95		1.00	0.99		1.00	0.99	
Flt Protected		0.96			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759			1718		1770	1818		1770	1806	
Flt Permitted		0.70			0.82		0.25	1.00		0.20	1.00	
Satd. Flow (perm)		1293			1454		458	1818		370	1806	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	119	2	14	40	2	25	5	886	35	18	762	73
RTOR Reduction (vph)	0	7	0	0	21	0	0	2	0	0	5	0
Lane Group Flow (vph)	0	128	0	0	46	0	5	919	0	18	830	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	4%	2%	2%	4%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.7			8.7		34.8	34.8		34.8	34.8	
Effective Green, g (s)		8.7			8.7		34.8	34.8		34.8	34.8	
Actuated g/C Ratio		0.17			0.17		0.68	0.68		0.68	0.68	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		218			245		309	1228		250	1220	
v/s Ratio Prot								c0.51			0.46	
v/s Ratio Perm		c0.10			0.03		0.01			0.05		
v/c Ratio		0.58			0.19		0.02	0.75		0.07	0.68	
Uniform Delay, d1		19.7			18.4		2.7	5.5		2.8	5.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		4.0			0.4		0.0	2.5		0.1	1.6	
Delay (s)		23.7			18.7		2.8	8.0		3.0	6.6	
Level of Service		C			B		A	A		A	A	
Approach Delay (s)		23.7			18.7			8.0			6.5	
Approach LOS		C			B			A			A	

Intersection Summary				
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	51.5	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	66.1%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Appendix C

Queuing Calculations

Queuing and Blocking Report
AM Peak Hour Cumulative Conditions 01/25/2017

Intersection: 4: Petaluma Blvd N & Oak St

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	134	54	24	41	23	5
Average Queue (ft)	91	30	7	14	5	1
95th Queue (ft)	173	72	28	99	25	10
Link Distance (ft)	368			1226		368
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			70		70	
Storage Blk Time (%)				2		
Queuing Penalty (veh)				0		

Queuing and Blocking Report
PM Peak Hour Cumulative Conditions 01/25/2017

Intersection: 4: Petaluma Blvd N & Oak St

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	L	L	TR
Maximum Queue (ft)	179	58	13	21	16
Average Queue (ft)	124	35	4	6	3
95th Queue (ft)	242	70	19	26	40
Link Distance (ft)	368				368
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			70	70	
Storage Blk Time (%)					1
Queuing Penalty (veh)					0

Queuing and Blocking Report
AM Peak Hour Cumulative Conditions 01/25/2017

Intersection: 5: Petaluma Blvd N & Washington St/E Washington St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	T	R
Maximum Queue (ft)	129	275	266	100	124	135	138	499	150	173	937	145
Average Queue (ft)	103	188	175	69	103	117	84	384	113	97	688	88
95th Queue (ft)	157	296	295	116	143	152	166	631	204	206	1196	198
Link Distance (ft)		495	495		111	111		609			1226	
Upstream Blk Time (%)				2	14	19		4				
Queuing Penalty (veh)				0	64	92		27				
Storage Bay Dist (ft)	105			308			80		100	160		120
Storage Blk Time (%)	11	23		2	14		4	48	0	0	51	0
Queuing Penalty (veh)	36	31		7	20		25	105	3	0	115	1

Queuing and Blocking Report
PM Peak Hour Cumulative Conditions 01/25/2017

Intersection: 5: Petaluma Blvd N & Washington St/E Washington St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	T	R
Maximum Queue (ft)	130	462	431	110	161	135	131	620	150	184	870	145
Average Queue (ft)	122	380	320	97	132	124	86	601	110	146	667	48
95th Queue (ft)	154	526	469	126	171	141	164	701	206	221	1089	153
Link Distance (ft)		495	495		111	111		608			1226	
Upstream Blk Time (%)		6	0	17	34	27		31			0	
Queuing Penalty (veh)		0	0	0	193	156		321			4	
Storage Bay Dist (ft)	105			308			80		100	160		120
Storage Blk Time (%)	55	26		17	34		13	56	1	17	47	0
Queuing Penalty (veh)	199	41		68	80		122	220	6	119	124	0

Queuing and Blocking Report
AM Peak Hour Cumulative plus Project Alt 1 (Mitigated) 01/25/2017

Intersection: 4: Petaluma Blvd N & Oak St

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	76	64	22	162	48	340
Average Queue (ft)	47	38	6	98	15	247
95th Queue (ft)	85	79	27	194	63	424
Link Distance (ft)	368			1226		368
Upstream Blk Time (%)						2
Queuing Penalty (veh)						22
Storage Bay Dist (ft)			70		70	
Storage Blk Time (%)				7		26
Queuing Penalty (veh)				1		4

Queuing and Blocking Report
PM Peak Hour Cumulative plus Project Alt 1 (Mitigated) 01/25/2017

Intersection: 4: Petaluma Blvd N & Oak St

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	110	53	14	238	51	292
Average Queue (ft)	69	33	3	159	22	177
95th Queue (ft)	126	65	20	289	64	330
Link Distance (ft)	368			1226		368
Upstream Blk Time (%)						0
Queuing Penalty (veh)						3
Storage Bay Dist (ft)			70		70	
Storage Blk Time (%)				14	0	17
Queuing Penalty (veh)				1	0	4

Queuing and Blocking Report
AM Peak Hour Cumulative plus Project Alt 1 (Mitigated) 01/25/2017

Intersection: 5: Petaluma Blvd N & Washington St/E Washington St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	T	R
Maximum Queue (ft)	127	227	234	103	130	133	149	528	145	168	1058	134
Average Queue (ft)	98	180	172	71	107	115	79	452	104	91	811	80
95th Queue (ft)	153	247	253	113	143	146	167	679	204	198	1322	187
Link Distance (ft)		495	495		111	111		607			1226	
Upstream Blk Time (%)				2	12	20		4			1	
Queuing Penalty (veh)				0	57	97		30			10	
Storage Bay Dist (ft)	105			308			80		100	160		120
Storage Blk Time (%)	7	26		2	12		3	51	1		53	0
Queuing Penalty (veh)	23	36		6	17		19	112	9		129	1

Queuing and Blocking Report
PM Peak Hour Cumulative plus Project Alt 1 (Mitigated) 01/25/2017

Intersection: 5: Petaluma Blvd N & Washington St/E Washington St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	T	R
Maximum Queue (ft)	130	424	354	110	152	140	133	627	145	184	855	133
Average Queue (ft)	123	303	263	95	129	127	91	586	110	154	615	58
95th Queue (ft)	149	453	386	123	159	146	175	735	204	219	1102	162
Link Distance (ft)		495	495		111	111		616			1226	
Upstream Blk Time (%)		0		15	25	28		26			1	
Queuing Penalty (veh)		0		0	146	165		273			5	
Storage Bay Dist (ft)	105			308			80		100	160		120
Storage Blk Time (%)	41	33		15	25		14	59	1	19	42	0
Queuing Penalty (veh)	148	53		59	59		130	231	5	134	121	0

Queuing and Blocking Report
AM Peak Hour Cumulative plus Project Alt 2 (Mitigated) 01/25/2017

Intersection: 4: Petaluma Blvd N & Oak St

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	72	70	30	167	14	306
Average Queue (ft)	49	36	9	104	4	200
95th Queue (ft)	86	76	45	189	23	343
Link Distance (ft)	368			1226		368
Upstream Blk Time (%)						1
Queuing Penalty (veh)						13
Storage Bay Dist (ft)			70		70	
Storage Blk Time (%)				7		22
Queuing Penalty (veh)				1		3

Queuing and Blocking Report
PM Peak Hour Cumulative plus Project Alt 2 (Mitigated) 01/25/2017

Intersection: 4: Petaluma Blvd N & Oak St

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	79	61	21	170	42	311
Average Queue (ft)	50	43	6	112	13	211
95th Queue (ft)	94	78	25	194	47	349
Link Distance (ft)	368			1226		368
Upstream Blk Time (%)						0
Queuing Penalty (veh)						4
Storage Bay Dist (ft)			70		70	
Storage Blk Time (%)				8		20
Queuing Penalty (veh)				1		3

Queuing and Blocking Report
AM Peak Hour Cumulative plus Project Alt 2 (Mitigated) 01/25/2017

Intersection: 5: Petaluma Blvd N & Washington St/E Washington St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	T	R
Maximum Queue (ft)	129	321	293	101	137	134	154	459	145	173	971	145
Average Queue (ft)	107	220	197	76	111	116	81	371	97	96	679	96
95th Queue (ft)	150	356	333	117	153	150	167	543	197	210	1153	198
Link Distance (ft)		495	495		111	111		618			1226	
Upstream Blk Time (%)				4	19	26					1	
Queuing Penalty (veh)				0	93	122					10	
Storage Bay Dist (ft)	105			308			80		100	160		120
Storage Blk Time (%)	17	25		4	19		6	50	0	0	53	0
Queuing Penalty (veh)	57	35		15	29		43	110	2	4	130	2

Queuing and Blocking Report
PM Peak Hour Cumulative plus Project Alt 2 (Mitigated) 01/25/2017

Intersection: 5: Petaluma Blvd N & Washington St/E Washington St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	T	R
Maximum Queue (ft)	129	354	320	105	143	143	129	538	150	176	819	145
Average Queue (ft)	114	271	243	76	123	123	74	382	94	115	614	88
95th Queue (ft)	156	412	378	125	161	159	132	595	195	207	1053	192
Link Distance (ft)		495	495		111	111		609			1226	
Upstream Blk Time (%)		0	0	8	29	31		0			0	
Queuing Penalty (veh)		0	0	0	139	150		2			1	
Storage Bay Dist (ft)	105			308			80		100	160		120
Storage Blk Time (%)	31	30		8	29		5	44	1		46	0
Queuing Penalty (veh)	104	42		29	43		34	97	6		112	1

Queuing and Blocking Report
AM Peak Hour Cumulative plus Project Alt 3 (Mitigated) 01/25/2017

Intersection: 4: Petaluma Blvd N & Oak St

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	79	61	24	171	31	300
Average Queue (ft)	50	30	8	89	9	214
95th Queue (ft)	89	67	36	188	38	393
Link Distance (ft)	368			1226		368
Upstream Blk Time (%)						1
Queuing Penalty (veh)						11
Storage Bay Dist (ft)			70		70	
Storage Blk Time (%)				5		21
Queuing Penalty (veh)				0		3

Queuing and Blocking Report
PM Peak Hour Cumulative plus Project Alt 3 (Mitigated) 01/25/2017

Intersection: 4: Petaluma Blvd N & Oak St

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	87	70	6	265	43	242
Average Queue (ft)	59	39	2	161	11	158
95th Queue (ft)	97	79	13	283	49	307
Link Distance (ft)	368			1226		368
Upstream Blk Time (%)						0
Queuing Penalty (veh)						4
Storage Bay Dist (ft)			70		70	
Storage Blk Time (%)				12	0	15
Queuing Penalty (veh)				1	0	3

Queuing and Blocking Report
AM Peak Hour Cumulative plus Project Alt 3 (Mitigated) 01/25/2017

Intersection: 5: Petaluma Blvd N & Washington St/E Washington St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	T	R
Maximum Queue (ft)	128	251	232	102	136	137	131	500	133	184	881	133
Average Queue (ft)	98	184	160	73	109	116	74	398	94	112	698	88
95th Queue (ft)	158	277	262	121	153	155	154	653	193	215	1187	195
Link Distance (ft)		495	495		111	111		612			1226	
Upstream Blk Time (%)				4	16	20		4			1	
Queuing Penalty (veh)				0	76	96		33			10	
Storage Bay Dist (ft)	105			308			80		100	160		120
Storage Blk Time (%)	10	23		4	16		7	49	0	0	53	0
Queuing Penalty (veh)	34	32		16	24		46	107	2	0	126	3

Queuing and Blocking Report
PM Peak Hour Cumulative plus Project Alt 3 (Mitigated) 01/25/2017

Intersection: 5: Petaluma Blvd N & Washington St/E Washington St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	T	R
Maximum Queue (ft)	129	434	402	109	161	140	141	630	150	184	853	121
Average Queue (ft)	120	353	311	94	133	127	94	586	120	156	602	64
95th Queue (ft)	150	520	464	125	169	147	164	743	206	217	1088	166
Link Distance (ft)		495	495		111	111		617			1226	
Upstream Blk Time (%)		3	1	24	43	36		22			1	
Queuing Penalty (veh)		0	0	0	246	210		232			4	
Storage Bay Dist (ft)	105			308			80		100	160		120
Storage Blk Time (%)	41	39		24	43		21	55	1	24	39	0
Queuing Penalty (veh)	145	62		94	103		196	216	10	168	108	1

Appendix D

Signal Warrant Calculations

Warrant 3: Peak-Hour Volumes and Delay

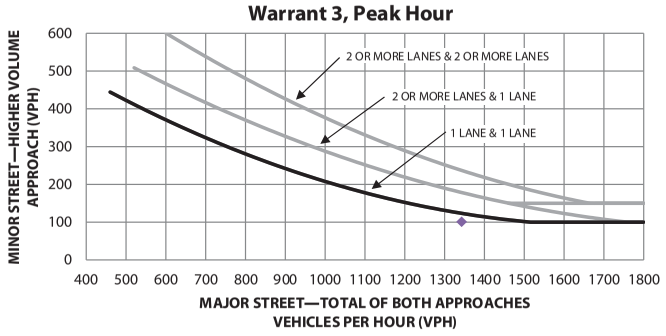
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: AM Existing

Warrant 3 Met?: Met when either Condition A or B is met	**No**
Condition A: Met when conditions A1, A2, and A3 are met	Not Met
Condition A1	Not Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 0.67 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 101 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1444 vph	
Condition B	Not Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

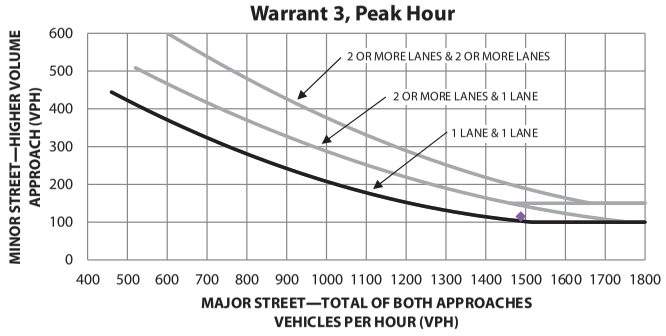
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: PM Existing

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Not Met
Condition A1	Not Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 0.94 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 115 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1603 vph	
Condition B	Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

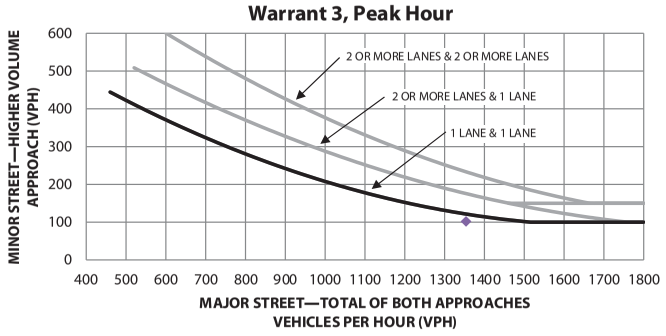
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: AM Existing plus Project Alt 2

Warrant 3 Met?: Met when either Condition A or B is met	**No**
Condition A: Met when conditions A1, A2, and A3 are met	Not Met
Condition A1	Not Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 4.96 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 102 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1492 vph	
Condition B	Not Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

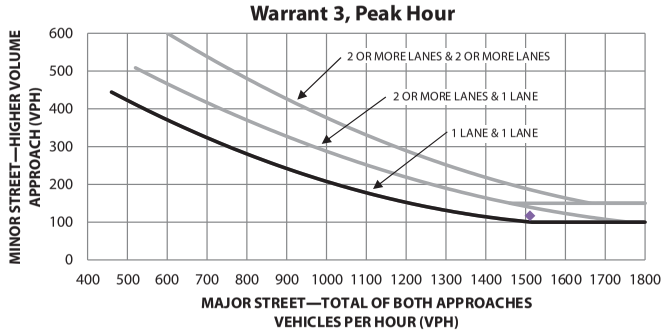
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: PM Existing plus Project Alt 2

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Met
Condition A1	Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 17.5 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 117 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1661 vph	
Condition B	Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

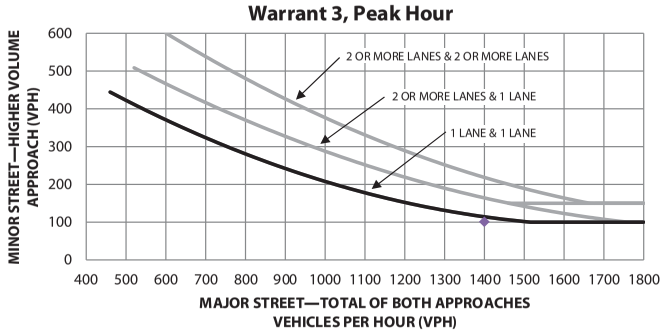
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: AM Existing plus Pipeline

Warrant 3 Met?: Met when either Condition A or B is met	**No**
Condition A: Met when conditions A1, A2, and A3 are met	Not Met
Condition A1	Not Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 0.72 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 101 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1501 vph	
Condition B	Not Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

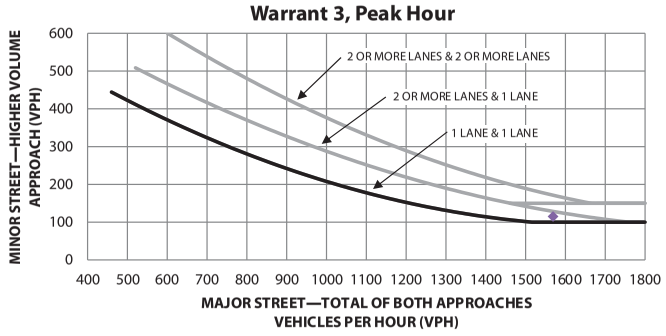
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: PM Existing plus Pipeline

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Not Met
Condition A1	Not Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 1.06 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 115 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1684 vph	
Condition B	Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

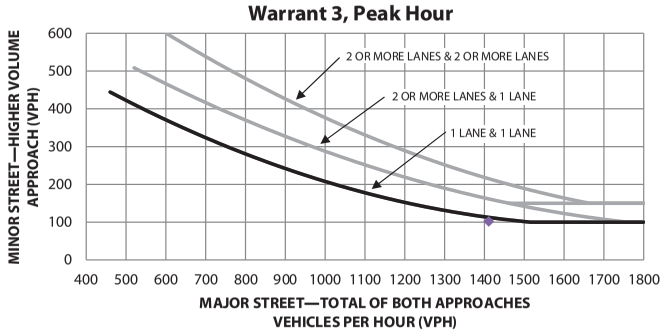
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: AM Existing plus Pipeline plus Project Alt 2

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Met
Condition A1	Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 6.84 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 102 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1549 vph	
Condition B	Not Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

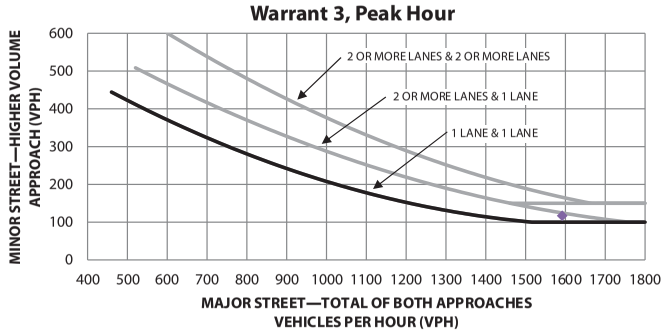
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: PM Existing plus Pipeline plus Project Alt 2

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Met
Condition A1	Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 26.17 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 117 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1742 vph	
Condition B	Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

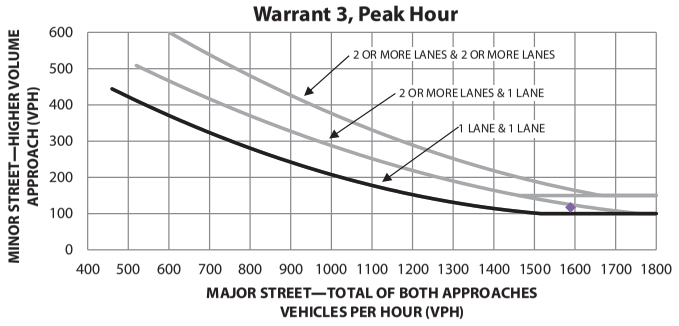
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: AM Cumulative

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Met
Condition A1	Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 11.98 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 117 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1746 vph	
Condition B	Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

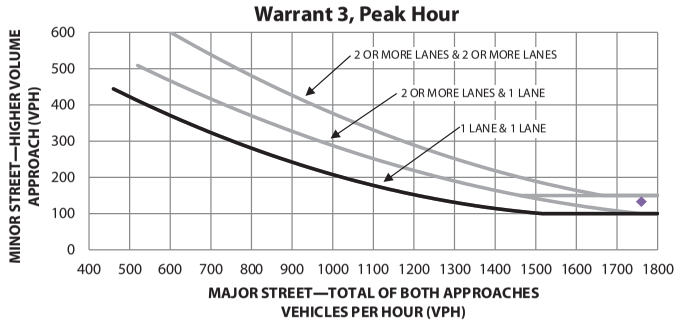
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: PM Cumulative

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Met
Condition A1	Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 14.78 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 133 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1933 vph	
Condition B	Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

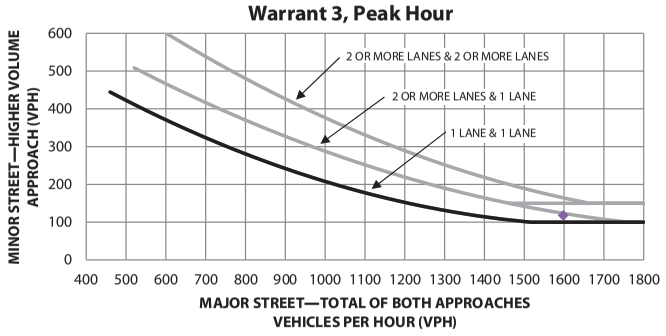
City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: AM Cumulative plus Project Alt 3

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Met
Condition A1	Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 14.25 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 118 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1785 vph	
Condition B	Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

City of Petaluma
Petaluma Blvd N & Oak St

PET200

	Major Street	Minor Street
Street Name	Petaluma Blvd N	Oak St
Direction	N-S	E-W
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Thursday, August 27, 2015
Scenario: PM Cumulative plus Project Alt 3

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Met
Condition A1	Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 15 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 135 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1981 vph	
Condition B	Met
The plotted point falls above the curve