Traffic Impact Study for the Hampton Inn & Suites at Santa Rosa

Prepared for the City of Santa Rosa

Submitted by
W-Trans

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Executive Summary

The proposed Inn at Santa Rosa would include 100 hotel rooms to be located at 3883 Airway Drive in the City of Santa Rosa. Based on application of standard trip generation rates, the project is anticipated to generate 817 daily trips on average, with 60 trips during the weekday p.m. peak hour and 72 trips during weekend p.m. peak hour.

The study area includes the intersections of Hopper Avenue/Airway Drive and Hopper Avenue-Cleveland Avenue/ US 101 Southbound Ramps. Analysis indicates that these intersections are expected to operate at acceptable levels of service upon the addition of project-generated traffic to both existing and future volumes. Similarly, pedestrian, bicycle and transit access are all expected to be generally adequate upon completion of currently planned facilities as well as those proposed as part of the project, though it is recommended that bike parking should be provided at the site per the City's code.

The adequacy of parking was evaluated based on the City of Santa Rosa's parking requirements for hotels. With a planned supply of 104 spaces, the parking supply would be sufficient to meet peak demands.

Introduction

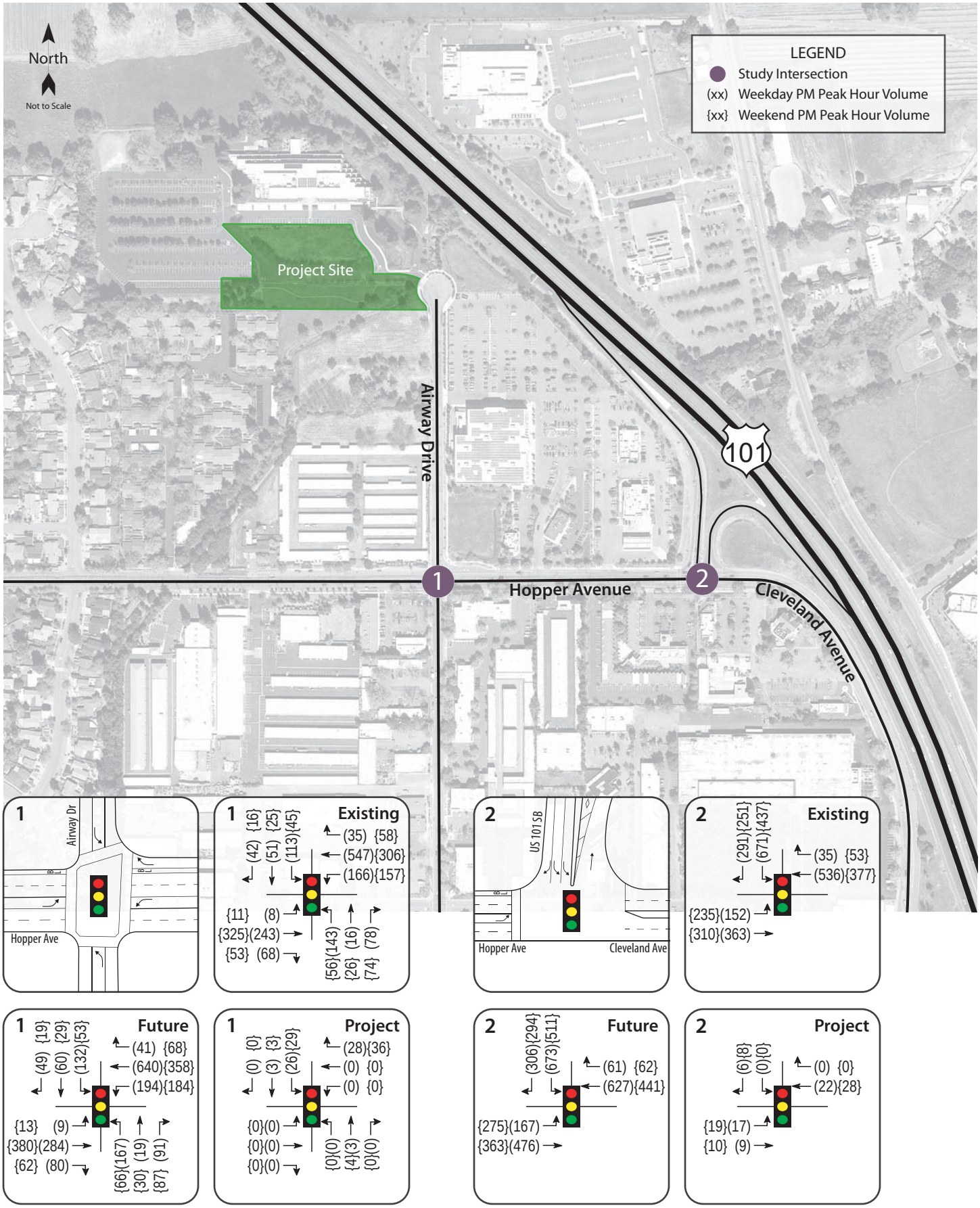
This report presents an analysis of the potential traffic impacts that would be associated with development of a proposed 100-room hotel to be located at 3883 Airway Drive in the City of Santa Rosa. The traffic study was completed in accordance with the criteria established by the City of Santa Rosa, and is consistent with standard traffic engineering techniques.

Prelude

The purpose of a traffic impact study is to provide City staff and policy makers with data 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 City'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 proposed project includes the construction of a 100-room hotel on a currently vacant site located at 3883 Airway Drive in the City of Santa Rosa. The project site would be accessed via Airway Drive. The project location is shown in Figure 1.



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Traffic Impact Study for the Hampton Inn & Suites at Santa Rosa

Figure 1 – Study Area, Lane Configurations, and Traffic Volumes

Transportation Setting

Operational Analysis

Study Area and Periods

The study area consists of the following intersections:

1. Hopper Avenue/Airway Drive
2. Hopper Avenue-Cleveland Avenue/US 101 SB Ramps

Operating conditions during the weekday p.m. peak and midday peak periods were evaluated as these time periods reflect the highest traffic volumes areawide and for the proposed project. The weekday evening peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion of the day during the homeward bound commute, while the weekend midday peak occurs between the hours of 11:00 a.m. and 1:00 p.m. when local retail enterprises are at their busiest.

Study Intersections

Hopper Avenue/Airway Drive is a four-legged signalized intersection with protected/permitted left-turn phasing on the eastbound and westbound approaches and permitted left-turn phasing on the northbound and southbound approaches. Marked pedestrian crosswalks and phasing are provided on all legs.

Hopper Avenue-Cleveland Avenue/US 101 SB Ramps is a signalized tee-intersection with protected left-turn phasing on the eastbound approach. The north leg serves as an on- and off-ramp to US 101 southbound. There is a marked pedestrian crosswalk on the west leg.

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

Collision History

The collision histories for the study intersections were 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 January 1, 2012 through December 31, 2016.

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 *2013 Collision Data on California State Highways*, California Department of Transportation (Caltrans). The collision rates are less than or approximately equal to the statewide collision average, indicating that there is not a demonstrated safety concern or issue, so no further review was performed. The collision rate calculations are provided in Appendix A.

Table 1 – Collision Rates at the Study Intersections			
Study Intersection	**Number of Collisions (2012-2016)**	**Calculated Collision Rate (c/mve)**	**Statewide Average Collision Rate (c/mve)**
1. Hopper Ave/Airway Dr	12	0.44	0.43
2. Hopper Ave-Cleveland Ave/ US 101 S Ramps	6	0.16	0.27

Note: c/mve = collisions per million vehicles entering

Alternative Modes

Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians within the vicinity of the proposed project site. While there is no sidewalk for approximately 400 feet on the west side of Airway Drive, continuous sidewalk is provided on the east side of Airway Drive extending south of the project area to Hopper Avenue where fast food restaurants, commercial and retail land uses are located. There is also continuous sidewalk for the entire length of Hopper Avenue. Marked pedestrian crossings are provided at each study intersection

Bicycle Facilities

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

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

In the project area, Class II bike lanes exist on Coffey Lane and extend from Hopper Avenue to Guerneville Road. The *Santa Rosa Bicycle and Pedestrian Master Plan* includes plans for Class II bike lanes on Hopper Avenue, which would start east of Airway Drive and continue on Cleveland Avenue. There are also plans for Class III bike sharrows on Hopper Avenue between Barnes Road and Coffey Lane. Table 2 summarizes the existing and planned bicycle facilities in the project vicinity.

Table 2 – Bicycle Facility Summary				
Status **Facility**	**Class**	**Length (miles)**	**Begin Point**	**End Point**
Existing				
Coffey Ln	II	1.9	Hopper Ave	Guerneville Rd
Planned				
Hopper Ave/Cleveland Ave	II	2.1	Coffey Ln	W Steele Ln
Hopper Ave	III	0.5	Barnes Rd	Coffey Ln

Source: *Santa Rosa Bicycle and Pedestrian Master Plan*, City of Santa Rosa, 2014

Transit Facilities

The Santa Rosa CityBus provides fixed route bus service in the City of Santa Rosa. CityBus Route 10 provides loop service to destinations throughout the City and stops at the intersection of Hopper Avenue/Airway Drive, approximately 0.2 miles south of the project site. Route 10 operates Monday through Friday with approximately 30-minute headways between 6:15 a.m. and 8:15 p.m. Route 10 also operates on Saturdays from 7:45 a.m. to 5:30 p.m. with approximately one-hour headways and on Sundays with one-hour headways between 9:45 a.m. and 4:30 p.m.

Two bicycles can be carried on most CityBus buses. Bike rack space is on a first come, first served basis. Additional bicycles are allowed on CityBus 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.

Capacity Analysis

Intersection Level of Service Methodologies

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

The study intersections were analyzed using the signalized methodology published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2010. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle. The signalized methodology is based on factors including traffic volumes, green time for each movement, phasing, whether 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. Signal timing was provided by the City and used in this analysis.

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

Table 3 – Signalized Intersection Level of Service Criteria	
LOS A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
LOS B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
LOS C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
LOS D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
LOS E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
LOS F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

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

Traffic Operation Standards

City of Santa Rosa

The City of Santa Rosa's adopted Level of Service (LOS) Standard is contained in *Santa Rosa General Plan 2035*. Standard TD-1 states that the City will try to maintain a Level of Service (LOS) D or better along all major corridors. Exceptions to meeting this standard are allowed where attainment would result in significant environmental degradation; where topography or environmental impacts make the improvement impossible; or where attainment would ensure loss of an area's unique character.

While a corridor level of service is applied by the City in its analysis of the entire City as part of the environmental documentation supporting the General Plan, this type of analysis only provides relevant data when performed on a much longer segment than the one included as the study area for the project. Therefore, although the City's standard does not specify criteria for intersections, for the purposes of this study, as is standard practice for such studies, a minimum operation of LOS D for the overall operation of signalized intersections was applied.

Caltrans

Caltrans indicates that they endeavor to maintain operation at the transition from LOS C to LOS D. Based on previous discussions with Caltrans staff, it is understood that the standard is to be applied to the overall average intersection delay, and *not* that associated with any single movement or approach. Under this approach, if one movement experiences very high delay and also has moderate to high traffic volumes, the overall delay and level of service should reflect the critical nature of the condition. However, if one movement is expected to experience high delay, but has very low traffic volumes, the overall intersection operation will likely still meet Caltrans standards.

The intersection of Hopper Avenue-Cleveland Avenue/US 101 Southbound Ramps is a Caltrans facility. While the Caltrans standards of significance generally govern in this situation, the signal's operations was evaluated based on both the Caltrans and City standards.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the weekday p.m. and weekend midday peak periods. This condition does not include project-generated traffic volumes.

Under existing conditions, the study intersections are operating at acceptable Levels of Service. The existing traffic volumes are shown in Figure 1. A summary of the calculations is contained in Table 4, and copies are provided in Appendix B.

Table 4 – Existing Peak Hour Intersection Levels of Service

	Study Intersection	Weekday PM Peak		Weekend MD Peak	
		Delay	LOS	Delay	LOS
1.	Hopper Ave/Airway Dr	7.5	A	6.3	A
2.	Hopper Ave-Cleveland Ave/US 101 S Ramps	10.8	B	9.8	A

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

Future Conditions

Segment volumes for the horizon year of 2040 were obtained from the County's gravity demand model and translated to turning movement volumes at the study intersections using a combination of the "Furness" method and factoring, depending on how the model was configured at each intersection. The Furness method is an iterative process that employs existing turn movement data, existing link volumes, and future link volumes to project likely turning future movement volumes at intersections.

The County model does not include weekend volumes and the 2040 segment volumes in the model on Hopper Avenue at Airway Drive were lower than the 2017 p.m. peak hour data collected so factoring was required for some of the future volumes. The Furness method was used for Hopper Avenue-Cleveland Avenue/US 101 Southbound for weekday p.m. peak hour future volumes. From those volumes, a growth factor of 1.17 was calculated and then applied to Hopper Avenue/Airway Drive weekday p.m. and weekend midday volumes and to Hopper Avenue-Cleveland Avenue/US 101 Southbound ramps weekend midday volumes.

Intersection Levels of Service

With the calculated future volumes, the study intersections are expected to operate at acceptable service levels. The future traffic volumes are shown in Figure 1. A summary of the intersection level of service calculations is contained in Table 4, and copies of the Level of Service calculations are provided in Appendix B.

Table 5 – Future Peak Hour Intersection Levels of Service

Study Intersection	Weekday PM Peak		Weekend MD Peak	
	Delay	LOS	Delay	LOS
1. Hopper Ave/Airway Dr	8.3	A	6.8	A
2. Hopper Ave-Cleveland Ave/US 101 S Ramps	11.7	B	11.1	B

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

Project Description

The proposed project is a 100-room hotel to be constructed on a currently vacant parcel accessed via Airway Drive. The proposed project site plan is shown in Figure 2.

Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates for a "Hotel" (Land Use #310) published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 9th Edition, 2012. The proposed project is expected to generate an average of 817 trips per day, including 60 trips during the weekday p.m. peak hour or 72 trips during the weekend midday peak hour. These results are summarized in Table 6.

Table 6 – Trip Generation Summary

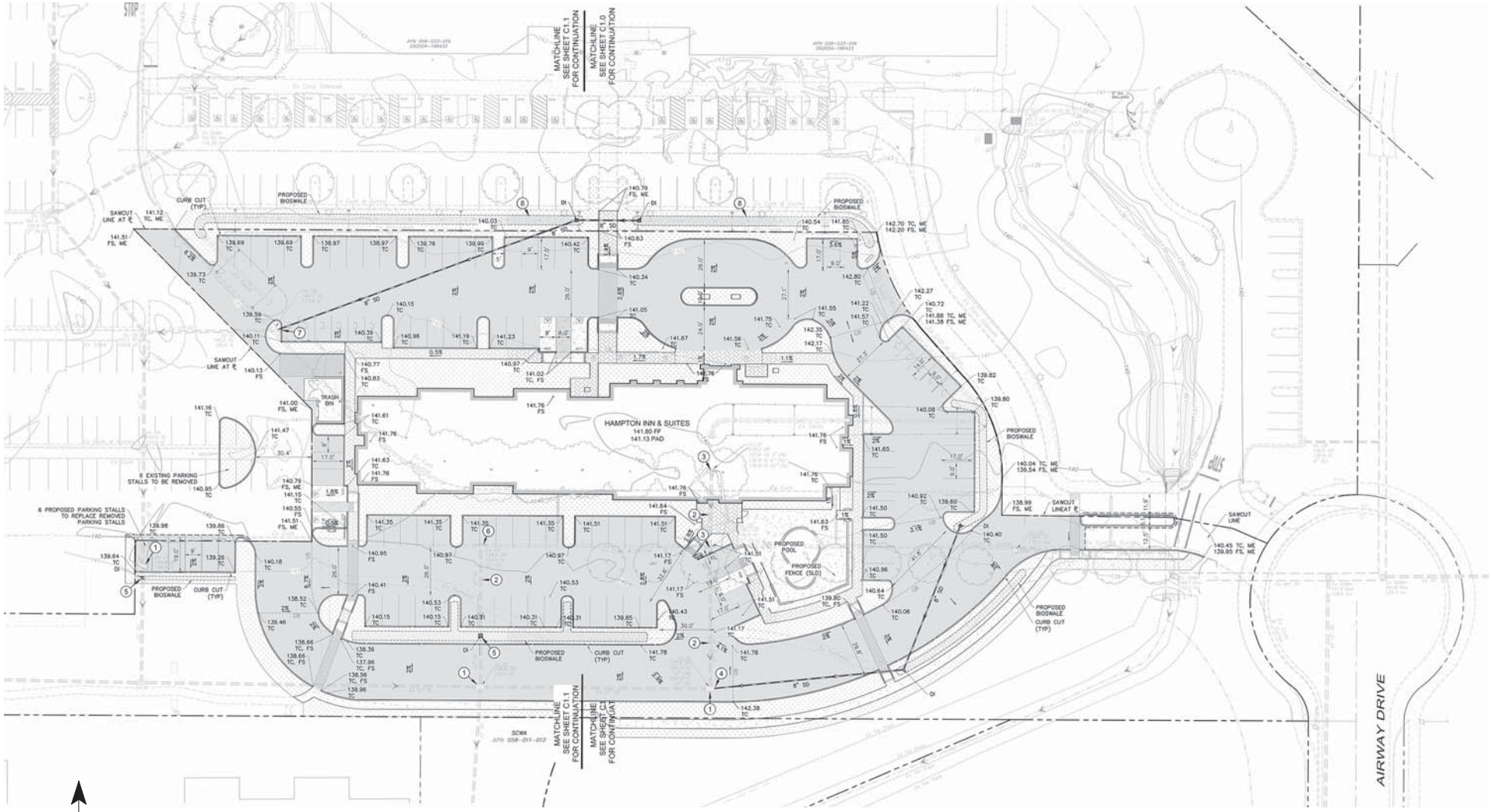
Land Use	Units	Daily		Weekday PM Peak Hour				Weekend MD Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Hotel	100 rooms	8.17	817	0.60	60	31	29	0.72	72	40	32

Trip Distribution

The pattern used to allocate new project trips to the street network was based on local knowledge of the area. The applied distribution assumptions and resulting trips are shown in Table 7.

Table 7 – Trip Distribution Assumptions

Route	Percent	Daily Trips	Weekday PM Trips	Weekend MD Trips
To/From US-101 South	60%	490	36	44
To/From US-101 North	20%	163	12	14
To/From Cleveland Ave	10%	82	6	7
To/From Airway Dr	10%	82	6	7
TOTAL	**100%**	**817**	**60**	**72**



North

Not to Scale

Source: Adobe Associates, Inc. 3/17

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Figure 2 – Site Plan

Intersection Operation

Existing plus Project Conditions

Upon the addition of project-related traffic to the Existing volumes, the study intersections are expected to continue to operate acceptably with minimal increases in delay. These results are summarized in Table 8. Project traffic volumes are shown in Figure 1.

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

Study Intersection	Existing Conditions				Existing plus Project			
	Weekday PM Peak		Weekend MD Peak		Weekday PM Peak		Weekend MD Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Hopper Ave/Airway Dr	7.5	A	6.3	A	7.6	A	6.6	A
2. Hopper Ave-Cleveland Ave/US 101 S Ramps	10.8	B	9.8	A	11.2	B	10.1	B

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

Finding – The study intersections are expected to continue operating acceptably at the same service levels upon the addition of project-generated traffic.

Future plus Project Conditions

Upon the addition of project-generated traffic to the anticipated Future volumes, the study intersections are expected to continue to operate acceptably. The Future plus Project operating conditions are summarized in Table 9.

Table 9 – Future and Future plus Project Peak Hour Intersection Levels of Service

Study Intersection	Future Conditions				Future plus Project			
	Weekday PM Peak		Weekend MD Peak		Weekday PM Peak		Weekend MD Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Hopper Ave/Airway Dr	8.3	A	6.8	A	8.4	A	7.1	A
2. Hopper Ave-Cleveland Ave/US 101 S Ramps	11.7	B	11.1	B	12.1	B	11.6	B

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

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

Alternative Modes

Pedestrian Facilities

Given the proximity of a variety of commercial and residential land uses to the site, it is reasonable to assume that some project guests and employees will want to walk, bicycle, and/or use transit for trips to and from the project site.

Sidewalks exist along the east side of Airway Drive, but not on the west side along the project frontage. However, the proposed site plans include a sidewalk extending from the project site to the existing sidewalk on Airway Drive.

Finding – Pedestrian facilities serving the project site are generally adequate, and would be more complete upon construction of the project.

Bicycle Facilities

Existing bicycle facilities provide adequate access for bicyclists.

Bicycle Storage

Existing and planned bicycle facilities, per the City's *Bicycle and Pedestrian Master Plan*, would provide adequate access for bicyclists. However, the proposed site plan does not include bicycle parking at the hotel. While the majority of hotel guests are expected to travel by vehicle, some guests and employees may wish to travel to and from the hotel by bike. According to the City of Santa Rosa's Municipal Code, Chapter 20.36.040, hotel land uses are required to provide one bicycle parking space plus one space per ten guest rooms. Based on City requirements, with plans for 100 rooms, the hotel would be required to provide 11 bicycle parking spaces.

Finding – Bicycle facilities on the streets serving the project site are adequate. However, there is no planned bicycle parking and provision of bicycles on-site for use by guests which would further promote use of this mode of transportations.

Recommendation – To meet City requirements, 11 bicycle parking spaces should be provided on-site. Also, the project applicants should consider implementing a bicycle-share program for guests.

Transit

Existing transit routes are adequate to accommodate project-generated transit trips. Existing stops are within acceptable walking distance of the site.

Finding – Transit facilities serving the project site are adequate.

Parking

The project was analyzed to determine whether the proposed parking supply would be sufficient for the anticipated parking demand. The project site as proposed would provide a total of 104 parking spaces.

Required Parking

City parking supply requirements are based on the City of Santa Rosa's Municipal Code, Chapter 20-36; Parking and Loading Standards. Based on the City's standards, the proposed project would be required to provide 100 parking spaces. With a planned supply of 104 parking spaces, parking would meet the City's requirements with a surplus of four spaces.

Conclusions and Recommendations

Conclusions

- The proposed hotel would generate an average of 817 daily trips with 60 trips during the weekday p.m. peak hour and 72 trips during the weekend p.m. peak hour.
- The study intersections are currently operating acceptably at LOS C or better and are expected to continue doing so under all scenarios evaluated.
- Pedestrian, bicycle, and transit facilities are generally adequate to serve the project site.
- The proposed hotel meets the City's parking requirements of 100 spaces with a planned supply of 104 spaces.

Recommendations

- The project should provide bicycle parking for at least 11 bicycles and consideration should be given to implementing a bicycle-share program at the hotel.

Study Participants and References

Study Participants

Principal in Charge	Dalene J. Whitlock, PE, PTOE
Assistant Engineer	Lauren Davini, PE
Engineering Intern	Bernice Liu
Graphics/Editing/Formatting	Angela McCoy

References

2013 Collision Data on California State Highways, California Department of Transportation, 2016
Guide for the Preparation of Traffic Impact Studies, California Department of Transportation, 2002
Highway Capacity Manual, Transportation Research Board, 2010
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Santa Rosa Bicycle and Pedestrian Master Plan, City of Santa Rosa, 2014
Santa Rosa City Code, Quality Code Publishing, 2017
Santa Rosa CityBus, http://srcity.org/1661/Maps-and-Schedules
Santa Rosa General Plan 2035, City of Santa Rosa, 2014
Statewide Integrated Traffic Records System (SWITRS), California Highway Patrol, 2012-2016
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Appendix A

Collision Rate Calculations

Intersection Collision Rate Calculations

Hampton Inn & Suites TIS

Intersection # 1: Airway Drive & Hopper Avenue
Date of Count: Saturday, January 00, 1900

Number of Collisions: 12
Number of Injuries: 10
Number of Fatalities: 0
ADT: 15100
Start Date: January 1, 2012
End Date: December 31, 2016
Number of Years: 5

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

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

$$\text{collision rate} = \frac{12 \times 1{,}000{,}000}{15{,}100 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.44 c/mve**	**0.0%**	**83.3%**
Statewide Average*	**0.43 c/mve**	**0.4%**	**37.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection # 2: Hopper Avenue-Cleveland Avenue & US 101 Southbound Ramps
Date of Count: Tuesday, May 02, 2017

Number of Collisions: 6
Number of Injuries: 2
Number of Fatalities: 0
ADT: 20400
Start Date: January 1, 2012
End Date: December 31, 2016
Number of Years: 5

Intersection Type: Tee
Control Type: Signals
Area: Suburban

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

$$\text{collision rate} = \frac{6 \times 1{,}000{,}000}{20{,}400 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.16 c/mve**	**0.0%**	**33.3%**
Statewide Average*	**0.27 c/mve**	**0.6%**	**37.3%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Appendix B

Intersection Level of Service Calculations

HCM 2010 Signalized Intersection Summary
1: Airway Dr & Hopper Ave

08/07/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	243	68	166	547	35	143	16	78	113	51	42
Future Volume (veh/h)	8	243	68	166	547	35	143	16	78	113	51	42
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	8	243	68	166	547	35	143	16	78	113	51	42
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	481	755	207	651	1295	580	525	68	332	520	233	192
Arrive On Green	0.01	0.27	0.27	0.10	0.37	0.37	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1774	2747	752	1774	3539	1583	1298	277	1348	1297	946	779
Grp Volume(v), veh/h	8	155	156	166	547	35	143	0	94	113	0	93
Grp Sat Flow(s),veh/h/ln	1774	1770	1730	1774	1770	1583	1298	0	1625	1297	0	1725
Q Serve(g_s), s	0.1	1.9	2.0	1.6	3.2	0.4	2.7	0.0	1.3	2.1	0.0	1.2
Cycle Q Clear(g_c), s	0.1	1.9	2.0	1.6	3.2	0.4	3.9	0.0	1.3	3.4	0.0	1.2
Prop In Lane	1.00		0.43	1.00		1.00	1.00		0.83	1.00		0.45
Lane Grp Cap(c), veh/h	481	486	476	651	1295	580	525	0	400	520	0	425
V/C Ratio(X)	0.02	0.32	0.33	0.25	0.42	0.06	0.27	0.00	0.23	0.22	0.00	0.22
Avail Cap(c_a), veh/h	1431	2242	2191	1440	4483	2006	1755	0	1941	1777	0	2098
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.2	8.0	8.0	5.2	6.6	5.7	9.8	0.0	8.3	9.7	0.0	8.3
Incr Delay (d2), s/veh	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.9	0.9	0.8	1.5	0.2	1.0	0.0	0.6	0.8	0.0	0.6
LnGrp Delay(d),s/veh	7.2	8.1	8.1	5.3	6.6	5.7	10.0	0.0	8.4	9.8	0.0	8.4
LnGrp LOS	A	A	A	A	A	A	A		A	A		A
Approach Vol, veh/h		319			748			237			206	
Approach Delay, s/veh		8.1			6.3			9.4			9.1	
Approach LOS		A			A			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.7	11.5		10.4	3.2	14.0		10.4
Change Period (Y+Rc), s	3.0	3.9		* 3.6	3.0	3.9		3.6
Max Green Setting (Gmax), s	15.0	35.0		* 34	15.0	35.0		33.0
Max Q Clear Time (g_c+I1), s	3.6	4.0		5.4	2.1	5.2		5.9
Green Ext Time (p_c), s	0.2	3.6		1.1	0.0	3.6		1.1

Intersection Summary	
HCM 2010 Ctrl Delay	7.5
HCM 2010 LOS	A

Notes

HCM 2010 Signalized Intersection Summary
1: Airway Dr & Hopper Ave

08/08/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	325	53	157	306	58	56	26	74	45	25	16
Future Volume (veh/h)	11	325	53	157	306	58	56	26	74	45	25	16
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	325	53	157	306	58	56	26	74	45	25	16
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	623	883	143	686	1328	594	502	68	195	448	170	109
Arrive On Green	0.01	0.29	0.29	0.10	0.38	0.38	0.16	0.16	0.16	0.16	0.16	0.16
Sat Flow, veh/h	1774	3053	493	1774	3539	1583	1360	428	1219	1290	1063	680
Grp Volume(v), veh/h	11	187	191	157	306	58	56	0	100	45	0	41
Grp Sat Flow(s),veh/h/ln	1774	1770	1776	1774	1770	1583	1360	0	1648	1290	0	1743
Q Serve(g_s), s	0.1	1.9	2.0	1.3	1.4	0.5	0.9	0.0	1.3	0.7	0.0	0.5
Cycle Q Clear(g_c), s	0.1	1.9	2.0	1.3	1.4	0.5	1.3	0.0	1.3	2.0	0.0	0.5
Prop In Lane	1.00		0.28	1.00		1.00	1.00		0.74	1.00		0.39
Lane Grp Cap(c), veh/h	623	512	514	686	1328	594	502	0	263	448	0	279
V/C Ratio(X)	0.02	0.37	0.37	0.23	0.23	0.10	0.11	0.00	0.38	0.10	0.00	0.15
Avail Cap(c_a), veh/h	1757	2681	2691	1668	5363	2399	2228	0	2354	2118	0	2535
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.7	6.5	6.5	4.4	4.9	4.7	8.9	0.0	8.7	9.6	0.0	8.3
Incr Delay (d2), s/veh	0.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.0	1.0	0.6	0.6	0.2	0.3	0.0	0.6	0.3	0.0	0.2
LnGrp Delay(d),s/veh	5.7	6.7	6.7	4.4	5.0	4.7	9.0	0.0	9.0	9.6	0.0	8.4
LnGrp LOS	A	A	A	A	A	A	A		A	A		A
Approach Vol, veh/h		389			521			156			86	
Approach Delay, s/veh		6.7			4.8			9.0			9.1	
Approach LOS		A			A			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.2	10.6		7.3	3.2	12.6		7.3
Change Period (Y+Rc), s	3.0	3.9		* 3.6	3.0	3.9		3.6
Max Green Setting (Gmax), s	15.0	35.0		* 34	15.0	35.0		33.0
Max Q Clear Time (g_c+I1), s	3.3	4.0		4.0	2.1	3.4		3.3
Green Ext Time (p_c), s	0.1	2.7		0.7	0.0	2.7		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	6.3
HCM 2010 LOS	A

Notes

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	152	363	536	25	671	291
Future Volume (veh/h)	152	363	536	25	671	291
Number	7	4	8	18	1	16
Initial Q (Qb), veh	2	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	160	382	564	13	706	191
Adj No. of Lanes	1	2	2	0	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	214	1811	1089	25	1034	667
Arrive On Green	0.12	0.51	0.31	0.31	0.30	0.30
Sat Flow, veh/h	1774	3632	3630	81	3442	1583
Grp Volume(v), veh/h	160	382	282	295	706	191
Grp Sat Flow(s),veh/h/ln	1774	1770	1770	1848	1721	1583
Q Serve(g_s), s	3.2	2.2	4.8	4.9	6.7	3.0
Cycle Q Clear(g_c), s	3.2	2.2	4.8	4.9	6.7	3.0
Prop In Lane	1.00			0.04	1.00	1.00
Lane Grp Cap(c), veh/h	214	1811	545	569	1034	667
V/C Ratio(X)	0.75	0.21	0.52	0.52	0.68	0.29
Avail Cap(c_a), veh/h	666	3451	913	954	2501	1336
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.9	5.0	10.7	10.7	11.5	7.1
Incr Delay (d2), s/veh	2.0	0.1	0.8	0.7	0.6	0.2
Initial Q Delay(d3),s/veh	2.5	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	1.1	2.5	2.6	3.3	0.1
LnGrp Delay(d),s/veh	20.4	5.0	11.4	11.4	12.1	7.3
LnGrp LOS	C	A	B	B	B	A
Approach Vol, veh/h		542	577		897	
Approach Delay, s/veh		9.6	11.4		11.1	
Approach LOS		A	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				22.8		14.2	7.4	15.3
Change Period (Y+Rc), s				3.9		3.1	3.1	3.9
Max Green Setting (Gmax), s				36.1		26.9	13.9	19.1
Max Q Clear Time (g_c+I1), s				4.2		8.7	5.2	6.9
Green Ext Time (p_c), s				6.6		2.5	0.1	4.6

Intersection Summary	
HCM 2010 Ctrl Delay	10.8
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
2: Hopper Ave/Cleveland Ave & US 101 SB 08/07/2017

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	235	310	377	53	437	251
Future Volume (veh/h)	235	310	377	53	437	251
Number	7	4	8	18	1	16
Initial Q (Qb), veh	2	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	247	326	397	43	460	149
Adj No. of Lanes	1	2	2	0	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	324	1975	904	97	786	651
Arrive On Green	0.18	0.56	0.28	0.28	0.23	0.23
Sat Flow, veh/h	1774	3632	3317	347	3442	1583
Grp Volume(v), veh/h	247	326	217	223	460	149
Grp Sat Flow(s),veh/h/ln	1774	1770	1770	1801	1721	1583
Q Serve(g_s), s	4.3	1.5	3.3	3.3	3.9	2.0
Cycle Q Clear(g_c), s	4.3	1.5	3.3	3.3	3.9	2.0
Prop In Lane	1.00			0.19	1.00	1.00
Lane Grp Cap(c), veh/h	324	1975	496	505	786	651
V/C Ratio(X)	0.76	0.17	0.44	0.44	0.59	0.23
Avail Cap(c_a), veh/h	757	3924	1038	1057	2843	1592
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.8	3.5	9.7	9.7	11.3	6.3
Incr Delay (d2), s/veh	1.4	0.0	0.6	0.6	0.5	0.1
Initial Q Delay(d3),s/veh	1.2	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.7	1.7	1.7	1.9	2.2
LnGrp Delay(d),s/veh	15.3	3.6	10.3	10.3	11.8	6.4
LnGrp LOS	B	A	B	B	B	A
Approach Vol, veh/h		573	440		609	
Approach Delay, s/veh		8.6	10.3		10.5	
Approach LOS		A	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				22.0		10.6	8.9	13.1
Change Period (Y+Rc), s				3.9		3.1	3.1	3.9
Max Green Setting (Gmax), s				36.1		26.9	13.9	19.1
Max Q Clear Time (g_c+I1), s				3.5		5.9	6.3	5.3
Green Ext Time (p_c), s				5.0		1.6	0.2	3.9

Intersection Summary	
HCM 2010 Ctrl Delay	9.8
HCM 2010 LOS	A

HCM 2010 Signalized Intersection Summary
1: Airway Dr & Hopper Ave

08/08/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	284	80	194	640	41	167	19	91	132	60	49
Future Volume (veh/h)	9	284	80	194	640	41	167	19	91	132	60	49
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	9	284	80	194	640	41	167	19	91	132	60	49
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	435	784	217	630	1375	615	511	76	363	506	256	209
Arrive On Green	0.01	0.29	0.29	0.11	0.39	0.39	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	1774	2741	758	1774	3539	1583	1279	281	1345	1278	950	776
Grp Volume(v), veh/h	9	182	182	194	640	41	167	0	110	132	0	109
Grp Sat Flow(s),veh/h/ln	1774	1770	1729	1774	1770	1583	1279	0	1625	1278	0	1726
Q Serve(g_s), s	0.1	2.6	2.7	2.1	4.3	0.5	3.7	0.0	1.7	2.8	0.0	1.6
Cycle Q Clear(g_c), s	0.1	2.6	2.7	2.1	4.3	0.5	5.2	0.0	1.7	4.5	0.0	1.6
Prop In Lane	1.00		0.44	1.00		1.00	1.00		0.83	1.00		0.45
Lane Grp Cap(c), veh/h	435	506	495	630	1375	615	511	0	439	506	0	466
V/C Ratio(X)	0.02	0.36	0.37	0.31	0.47	0.07	0.33	0.00	0.25	0.26	0.00	0.23
Avail Cap(c_a), veh/h	1265	1966	1921	1278	3932	1759	1505	0	1703	1524	0	1841
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.9	8.9	9.0	5.6	7.2	6.0	11.0	0.0	9.0	10.8	0.0	9.0
Incr Delay (d2), s/veh	0.0	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	1.2	1.3	1.0	2.1	0.2	1.3	0.0	0.7	1.0	0.0	0.7
LnGrp Delay(d),s/veh	7.9	9.1	9.1	5.7	7.3	6.1	11.1	0.0	9.1	10.9	0.0	9.1
LnGrp LOS	A	A	A	A	A	A	B		A	B		A
Approach Vol, veh/h		373			875			277			241	
Approach Delay, s/veh		9.1			6.9			10.3			10.1	
Approach LOS		A			A			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.5	12.9		12.1	3.3	16.1		12.1
Change Period (Y+Rc), s	3.0	3.9		* 3.6	3.0	3.9		3.6
Max Green Setting (Gmax), s	15.0	35.0		* 34	15.0	35.0		33.0
Max Q Clear Time (g_c+I1), s	4.1	4.7		6.5	2.1	6.3		7.2
Green Ext Time (p_c), s	0.2	4.4		1.4	0.0	4.3		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	8.3
HCM 2010 LOS	A

Notes

HCM 2010 Signalized Intersection Summary
1: Airway Dr & Hopper Ave

08/08/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	380	62	184	358	68	66	30	87	53	29	19
Future Volume (veh/h)	13	380	62	184	358	68	66	30	87	53	29	19
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	13	380	62	184	358	68	66	30	87	53	29	19
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	591	925	150	661	1409	630	495	77	224	432	192	126
Arrive On Green	0.01	0.30	0.30	0.11	0.40	0.40	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	1774	3051	494	1774	3539	1583	1352	422	1224	1270	1052	689
Grp Volume(v), veh/h	13	219	223	184	358	68	66	0	117	53	0	48
Grp Sat Flow(s),veh/h/ln	1774	1770	1776	1774	1770	1583	1352	0	1647	1270	0	1741
Q Serve(g_s), s	0.1	2.5	2.6	1.6	1.7	0.7	1.1	0.0	1.6	1.0	0.0	0.6
Cycle Q Clear(g_c), s	0.1	2.5	2.6	1.6	1.7	0.7	1.7	0.0	1.6	2.6	0.0	0.6
Prop In Lane	1.00		0.28	1.00		1.00	1.00		0.74	1.00		0.40
Lane Grp Cap(c), veh/h	591	536	538	661	1409	630	495	0	301	432	0	318
V/C Ratio(X)	0.02	0.41	0.41	0.28	0.25	0.11	0.13	0.00	0.39	0.12	0.00	0.15
Avail Cap(c_a), veh/h	1602	2402	2410	1503	4804	2149	1978	0	2107	1855	0	2269
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.1	7.1	7.2	4.5	5.2	4.9	9.6	0.0	9.3	10.4	0.0	8.9
Incr Delay (d2), s/veh	0.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	1.2	1.3	0.7	0.9	0.3	0.4	0.0	0.7	0.3	0.0	0.3
LnGrp Delay(d),s/veh	6.1	7.3	7.3	4.6	5.2	4.9	9.6	0.0	9.6	10.5	0.0	8.9
LnGrp LOS	A	A	A	A	A	A	A		A	B		A
Approach Vol, veh/h		455			610			183			101	
Approach Delay, s/veh		7.3			5.0			9.6			9.7	
Approach LOS		A			A			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.8	11.7		8.3	3.3	14.2		8.3
Change Period (Y+Rc), s	3.0	3.9		* 3.6	3.0	3.9		3.6
Max Green Setting (Gmax), s	15.0	35.0		* 34	15.0	35.0		33.0
Max Q Clear Time (g_c+I1), s	3.6	4.6		4.6	2.1	3.7		3.7
Green Ext Time (p_c), s	0.2	3.2		0.8	0.0	3.2		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	6.8
HCM 2010 LOS	A

Notes

HCM 2010 Signalized Intersection Summary
2: Hopper Ave/Cleveland Ave & US 101 SB

08/08/2017

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	167	476	627	61	673	306
Future Volume (veh/h)	167	476	627	61	673	306
Number	7	4	8	18	1	16
Initial Q (Qb), veh	2	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	176	501	660	51	708	207
Adj No. of Lanes	1	2	2	0	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	234	1918	1119	86	1002	669
Arrive On Green	0.13	0.54	0.34	0.34	0.29	0.29
Sat Flow, veh/h	1774	3632	3423	257	3442	1583
Grp Volume(v), veh/h	176	501	350	361	708	207
Grp Sat Flow(s),veh/h/ln	1774	1770	1770	1817	1721	1583
Q Serve(g_s), s	4.0	3.2	6.8	6.8	7.6	3.6
Cycle Q Clear(g_c), s	4.0	3.2	6.8	6.8	7.6	3.6
Prop In Lane	1.00			0.14	1.00	1.00
Lane Grp Cap(c), veh/h	234	1918	595	611	1002	669
V/C Ratio(X)	0.75	0.26	0.59	0.59	0.71	0.31
Avail Cap(c_a), veh/h	593	3072	813	835	2226	1227
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.6	5.1	11.5	11.6	13.3	8.0
Incr Delay (d2), s/veh	1.9	0.1	0.9	0.9	0.7	0.2
Initial Q Delay(d3),s/veh	2.1	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	1.6	3.5	3.6	3.7	3.8
LnGrp Delay(d),s/veh	21.6	5.2	12.5	12.5	14.0	8.2
LnGrp LOS	C	A	B	B	B	A
Approach Vol, veh/h		677	711		915	
Approach Delay, s/veh		9.5	12.5		12.7	
Approach LOS		A	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				26.4		15.2	8.4	17.9
Change Period (Y+Rc), s				3.9		3.1	3.1	3.9
Max Green Setting (Gmax), s				36.1		26.9	13.9	19.1
Max Q Clear Time (g_c+I1), s				5.2		9.6	6.0	8.8
Green Ext Time (p_c), s				8.8		2.5	0.1	5.2

Intersection Summary	
HCM 2010 Ctrl Delay	11.7
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
2: Hopper Ave/Cleveland Ave & US 101 SB

08/08/2017

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	275	363	441	62	511	294
Future Volume (veh/h)	275	363	441	62	511	294
Number	7	4	8	18	1	16
Initial Q (Qb), veh	2	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	289	382	464	52	538	194
Adj No. of Lanes	1	2	2	0	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	367	2032	920	103	838	713
Arrive On Green	0.20	0.57	0.29	0.29	0.24	0.24
Sat Flow, veh/h	1774	3632	3304	358	3442	1583
Grp Volume(v), veh/h	289	382	255	261	538	194
Grp Sat Flow(s),veh/h/ln	1774	1770	1770	1800	1721	1583
Q Serve(g_s), s	5.9	2.0	4.6	4.6	5.3	2.9
Cycle Q Clear(g_c), s	5.9	2.0	4.6	4.6	5.3	2.9
Prop In Lane	1.00			0.20	1.00	1.00
Lane Grp Cap(c), veh/h	367	2032	507	516	838	713
V/C Ratio(X)	0.79	0.19	0.50	0.51	0.64	0.27
Avail Cap(c_a), veh/h	647	3352	887	902	2429	1440
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.5	3.9	11.4	11.4	13.0	6.6
Incr Delay (d2), s/veh	1.4	0.0	0.8	0.8	0.6	0.2
Initial Q Delay(d3),s/veh	1.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	1.0	2.3	2.4	2.6	3.2
LnGrp Delay(d),s/veh	17.0	3.9	12.2	12.2	13.6	6.8
LnGrp LOS	B	A	B	B	B	A
Approach Vol, veh/h		671	516		732	
Approach Delay, s/veh		9.6	12.2		11.8	
Approach LOS		A	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				25.7		12.4	10.9	14.9
Change Period (Y+Rc), s				3.9		3.1	3.1	3.9
Max Green Setting (Gmax), s				36.1		26.9	13.9	19.1
Max Q Clear Time (g_c+I1), s				4.0		7.3	7.9	6.6
Green Ext Time (p_c), s				6.1		2.0	0.2	4.4

Intersection Summary	
HCM 2010 Ctrl Delay	11.1
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
1: Airway Dr & Hopper Ave

08/08/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	243	68	166	547	63	143	19	78	139	54	42
Future Volume (veh/h)	8	243	68	166	547	63	143	19	78	139	54	42
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	8	243	68	166	547	63	143	19	78	139	54	42
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	472	754	206	648	1293	578	526	80	330	522	245	190
Arrive On Green	0.01	0.27	0.27	0.10	0.37	0.37	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1774	2747	752	1774	3539	1583	1294	320	1312	1293	973	757
Grp Volume(v), veh/h	8	155	156	166	547	63	143	0	97	139	0	96
Grp Sat Flow(s),veh/h/ln	1774	1770	1730	1774	1770	1583	1294	0	1631	1293	0	1729
Q Serve(g_s), s	0.1	1.9	2.0	1.6	3.2	0.7	2.8	0.0	1.3	2.7	0.0	1.2
Cycle Q Clear(g_c), s	0.1	1.9	2.0	1.6	3.2	0.7	4.0	0.0	1.3	4.0	0.0	1.2
Prop In Lane	1.00		0.43	1.00		1.00	1.00		0.80	1.00		0.44
Lane Grp Cap(c), veh/h	472	485	475	648	1293	578	526	0	410	522	0	435
V/C Ratio(X)	0.02	0.32	0.33	0.26	0.42	0.11	0.27	0.00	0.24	0.27	0.00	0.22
Avail Cap(c_a), veh/h	1411	2216	2167	1425	4432	1983	1729	0	1926	1751	0	2079
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.2	8.1	8.1	5.3	6.7	5.9	9.9	0.0	8.3	9.9	0.0	8.3
Incr Delay (d2), s/veh	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.0	1.0	0.8	1.5	0.3	1.0	0.0	0.6	0.9	0.0	0.6
LnGrp Delay(d),s/veh	7.3	8.2	8.2	5.4	6.7	5.9	10.0	0.0	8.4	10.0	0.0	8.4
LnGrp LOS	A	A	A	A	A	A	A		A	B		A
Approach Vol, veh/h		319			776			240			235	
Approach Delay, s/veh		8.2			6.4			9.3			9.4	
Approach LOS		A			A			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.8	11.6		10.6	3.2	14.1		10.6
Change Period (Y+Rc), s	3.0	3.9		* 3.6	3.0	3.9		3.6
Max Green Setting (Gmax), s	15.0	35.0		* 34	15.0	35.0		33.0
Max Q Clear Time (g_c+I1), s	3.6	4.0		6.0	2.1	5.2		6.0
Green Ext Time (p_c), s	0.2	3.7		1.2	0.0	3.6		1.2

Intersection Summary	
HCM 2010 Ctrl Delay	7.6
HCM 2010 LOS	A

Notes

HCM 2010 Signalized Intersection Summary
1: Airway Dr & Hopper Ave

08/08/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	325	53	157	306	94	56	30	74	74	28	16
Future Volume (veh/h)	11	325	53	157	306	94	56	30	74	74	28	16
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	325	53	157	306	94	56	30	74	74	28	16
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	594	865	140	663	1301	582	524	89	221	469	209	119
Arrive On Green	0.01	0.28	0.28	0.09	0.37	0.37	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	1774	3053	493	1774	3539	1583	1357	477	1178	1285	1114	637
Grp Volume(v), veh/h	11	187	191	157	306	94	56	0	104	74	0	44
Grp Sat Flow(s),veh/h/ln	1774	1770	1776	1774	1770	1583	1357	0	1655	1285	0	1750
Q Serve(g_s), s	0.1	2.0	2.1	1.4	1.4	1.0	0.9	0.0	1.3	1.3	0.0	0.5
Cycle Q Clear(g_c), s	0.1	2.0	2.1	1.4	1.4	1.0	1.4	0.0	1.3	2.6	0.0	0.5
Prop In Lane	1.00		0.28	1.00		1.00	1.00		0.71	1.00		0.36
Lane Grp Cap(c), veh/h	594	502	503	663	1301	582	524	0	310	469	0	328
V/C Ratio(X)	0.02	0.37	0.38	0.24	0.24	0.16	0.11	0.00	0.34	0.16	0.00	0.13
Avail Cap(c_a), veh/h	1678	2564	2573	1597	5128	2294	2123	0	2261	2015	0	2435
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.1	6.9	6.9	4.7	5.3	5.1	8.8	0.0	8.5	9.6	0.0	8.2
Incr Delay (d2), s/veh	0.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.0	1.0	0.7	0.7	0.4	0.3	0.0	0.6	0.5	0.0	0.3
LnGrp Delay(d),s/veh	6.1	7.1	7.1	4.8	5.3	5.2	8.8	0.0	8.7	9.7	0.0	8.3
LnGrp LOS	A	A	A	A	A	A	A		A	A		A
Approach Vol, veh/h		389			557			160			118	
Approach Delay, s/veh		7.1			5.1			8.8			9.2	
Approach LOS		A			A			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.3	10.7		8.1	3.2	12.8		8.1
Change Period (Y+Rc), s	3.0	3.9		* 3.6	3.0	3.9		3.6
Max Green Setting (Gmax), s	15.0	35.0		* 34	15.0	35.0		33.0
Max Q Clear Time (g_c+I1), s	3.4	4.1		4.6	2.1	3.4		3.4
Green Ext Time (p_c), s	0.1	2.8		0.8	0.0	2.8		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	6.6
HCM 2010 LOS	A

Notes

HCM 2010 Signalized Intersection Summary
2: Hopper Ave/Cleveland Ave & US 101 SB

08/08/2017

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	169	372	558	25	671	297
Future Volume (veh/h)	169	372	558	25	671	297
Number	7	4	8	18	1	16
Initial Q (Qb), veh	2	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	178	392	587	13	706	198
Adj No. of Lanes	1	2	2	0	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	237	1849	1093	24	1022	682
Arrive On Green	0.13	0.52	0.31	0.31	0.30	0.30
Sat Flow, veh/h	1774	3632	3633	78	3442	1583
Grp Volume(v), veh/h	178	392	293	307	706	198
Grp Sat Flow(s),veh/h/ln	1774	1770	1770	1849	1721	1583
Q Serve(g_s), s	3.7	2.3	5.3	5.3	7.0	3.1
Cycle Q Clear(g_c), s	3.7	2.3	5.3	5.3	7.0	3.1
Prop In Lane	1.00			0.04	1.00	1.00
Lane Grp Cap(c), veh/h	237	1849	546	571	1022	682
V/C Ratio(X)	0.75	0.21	0.54	0.54	0.69	0.29
Avail Cap(c_a), veh/h	640	3318	878	917	2405	1312
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.3	5.0	11.1	11.1	12.1	7.2
Incr Delay (d2), s/veh	1.8	0.1	0.8	0.8	0.6	0.2
Initial Q Delay(d3),s/veh	2.1	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	1.1	2.7	2.8	3.4	3.4
LnGrp Delay(d),s/veh	20.1	5.0	12.0	11.9	12.7	7.4
LnGrp LOS	C	A	B	B	B	A
Approach Vol, veh/h		570	600		904	
Approach Delay, s/veh		9.7	11.9		11.5	
Approach LOS		A	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				23.9		14.6	8.1	15.8
Change Period (Y+Rc), s				3.9		3.1	3.1	3.9
Max Green Setting (Gmax), s				36.1		26.9	13.9	19.1
Max Q Clear Time (g_c+I1), s				4.3		9.0	5.7	7.3
Green Ext Time (p_c), s				6.8		2.5	0.1	4.7

Intersection Summary	
HCM 2010 Ctrl Delay	11.2
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
2: Hopper Ave/Cleveland Ave & US 101 SB

08/08/2017

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	254	320	405	53	437	259
Future Volume (veh/h)	254	320	405	53	437	259
Number	7	4	8	18	1	16
Initial Q (Qb), veh	2	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	267	337	426	43	460	158
Adj No. of Lanes	1	2	2	0	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	346	2018	924	93	775	666
Arrive On Green	0.19	0.57	0.29	0.29	0.23	0.23
Sat Flow, veh/h	1774	3632	3341	326	3442	1583
Grp Volume(v), veh/h	267	337	231	238	460	158
Grp Sat Flow(s),veh/h/ln	1774	1770	1770	1805	1721	1583
Q Serve(g_s), s	4.9	1.5	3.7	3.7	4.1	2.2
Cycle Q Clear(g_c), s	4.9	1.5	3.7	3.7	4.1	2.2
Prop In Lane	1.00			0.18	1.00	1.00
Lane Grp Cap(c), veh/h	346	2018	503	513	775	666
V/C Ratio(X)	0.77	0.17	0.46	0.46	0.59	0.24
Avail Cap(c_a), veh/h	725	3756	994	1014	2722	1556
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.1	3.5	10.1	10.1	11.9	6.4
Incr Delay (d2), s/veh	1.4	0.0	0.7	0.7	0.5	0.1
Initial Q Delay(d3),s/veh	1.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.8	1.8	1.9	2.0	0.1
LnGrp Delay(d),s/veh	15.6	3.5	10.8	10.8	12.4	6.5
LnGrp LOS	B	A	B	B	B	A
Approach Vol, veh/h		604	469		618	
Approach Delay, s/veh		8.8	10.8		10.9	
Approach LOS		A	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				23.2		10.8	9.6	13.6
Change Period (Y+Rc), s				3.9		3.1	3.1	3.9
Max Green Setting (Gmax), s				36.1		26.9	13.9	19.1
Max Q Clear Time (g_c+I1), s				3.5		6.1	6.9	5.7
Green Ext Time (p_c), s				5.3		1.6	0.2	4.0

Intersection Summary	
HCM 2010 Ctrl Delay	10.1
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
1: Airway Dr & Hopper Ave

08/08/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	284	80	194	640	69	167	22	91	158	63	49
Future Volume (veh/h)	9	284	80	194	640	69	167	22	91	158	63	49
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	9	284	80	194	640	69	167	22	91	158	63	49
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	428	783	217	627	1374	615	511	87	359	506	266	207
Arrive On Green	0.01	0.29	0.29	0.11	0.39	0.39	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	1774	2741	758	1774	3539	1583	1276	318	1313	1275	973	757
Grp Volume(v), veh/h	9	182	182	194	640	69	167	0	113	158	0	112
Grp Sat Flow(s),veh/h/ln	1774	1770	1729	1774	1770	1583	1276	0	1631	1275	0	1729
Q Serve(g_s), s	0.1	2.6	2.7	2.1	4.3	0.9	3.7	0.0	1.7	3.5	0.0	1.6
Cycle Q Clear(g_c), s	0.1	2.6	2.7	2.1	4.3	0.9	5.3	0.0	1.7	5.2	0.0	1.6
Prop In Lane	1.00		0.44	1.00		1.00	1.00		0.81	1.00		0.44
Lane Grp Cap(c), veh/h	428	506	494	627	1374	615	511	0	446	506	0	472
V/C Ratio(X)	0.02	0.36	0.37	0.31	0.47	0.11	0.33	0.00	0.25	0.31	0.00	0.24
Avail Cap(c_a), veh/h	1250	1948	1903	1268	3896	1743	1486	0	1693	1504	0	1828
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.0	9.0	9.1	5.6	7.3	6.2	11.0	0.0	9.0	11.1	0.0	9.0
Incr Delay (d2), s/veh	0.0	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	1.3	1.3	1.0	2.1	0.4	1.3	0.0	0.8	1.2	0.0	0.8
LnGrp Delay(d),s/veh	8.0	9.2	9.2	5.7	7.4	6.3	11.2	0.0	9.1	11.2	0.0	9.1
LnGrp LOS	A	A	A	A	A	A	B		A	B		A
Approach Vol, veh/h		373			903			280			270	
Approach Delay, s/veh		9.2			6.9			10.4			10.3	
Approach LOS		A			A			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.5	13.0		12.3	3.3	16.2		12.3
Change Period (Y+Rc), s	3.0	3.9		* 3.6	3.0	3.9		3.6
Max Green Setting (Gmax), s	15.0	35.0		* 34	15.0	35.0		33.0
Max Q Clear Time (g_c+I1), s	4.1	4.7		7.2	2.1	6.3		7.3
Green Ext Time (p_c), s	0.2	4.4		1.4	0.0	4.4		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	8.4
HCM 2010 LOS	A

Notes

HCM 2010 Signalized Intersection Summary
1: Airway Dr & Hopper Ave

08/08/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	380	62	184	358	104	66	34	87	82	32	19
Future Volume (veh/h)	13	380	62	184	358	104	66	34	87	82	32	19
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	13	380	62	184	358	104	66	34	87	82	32	19
Adj No. of Lanes	1	2	0	1	2	1	1	1	0	1	1	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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	563	906	147	641	1386	620	515	97	247	450	228	135
Arrive On Green	0.01	0.30	0.30	0.11	0.39	0.39	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1774	3051	494	1774	3539	1583	1348	464	1189	1265	1097	651
Grp Volume(v), veh/h	13	219	223	184	358	104	66	0	121	82	0	51
Grp Sat Flow(s),veh/h/ln	1774	1770	1776	1774	1770	1583	1348	0	1653	1265	0	1748
Q Serve(g_s), s	0.1	2.7	2.7	1.7	1.9	1.2	1.1	0.0	1.7	1.6	0.0	0.6
Cycle Q Clear(g_c), s	0.1	2.7	2.7	1.7	1.9	1.2	1.8	0.0	1.7	3.3	0.0	0.6
Prop In Lane	1.00		0.28	1.00		1.00	1.00		0.72	1.00		0.37
Lane Grp Cap(c), veh/h	563	525	527	641	1386	620	515	0	344	450	0	364
V/C Ratio(X)	0.02	0.42	0.42	0.29	0.26	0.17	0.13	0.00	0.35	0.18	0.00	0.14
Avail Cap(c_a), veh/h	1525	2290	2298	1435	4580	2049	1879	0	2017	1759	0	2171
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.5	7.6	7.6	4.8	5.6	5.4	9.5	0.0	9.2	10.6	0.0	8.7
Incr Delay (d2), s/veh	0.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	1.3	1.3	0.8	0.9	0.5	0.4	0.0	0.8	0.6	0.0	0.3
LnGrp Delay(d),s/veh	6.5	7.8	7.8	4.9	5.6	5.4	9.5	0.0	9.4	10.6	0.0	8.8
LnGrp LOS	A	A	A	A	A	A	A		A	B		A
Approach Vol, veh/h		455			646			187			133	
Approach Delay, s/veh		7.8			5.4			9.4			9.9	
Approach LOS		A			A			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.9	11.9		9.2	3.3	14.5		9.2
Change Period (Y+Rc), s	3.0	3.9		* 3.6	3.0	3.9		3.6
Max Green Setting (Gmax), s	15.0	35.0		* 34	15.0	35.0		33.0
Max Q Clear Time (g_c+I1), s	3.7	4.7		5.3	2.1	3.9		3.8
Green Ext Time (p_c), s	0.2	3.3		0.9	0.0	3.3		0.9

Intersection Summary	
HCM 2010 Ctrl Delay	7.1
HCM 2010 LOS	A

Notes

HCM 2010 Signalized Intersection Summary
2: Hopper Ave/Cleveland Ave & US 101 SB

08/08/2017

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	184	485	649	61	673	297
Future Volume (veh/h)	184	485	649	61	673	297
Number	7	4	8	18	1	16
Initial Q (Qb), veh	2	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	194	511	683	51	708	198
Adj No. of Lanes	1	2	2	0	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	255	1950	1121	84	990	683
Arrive On Green	0.14	0.55	0.34	0.34	0.29	0.29
Sat Flow, veh/h	1774	3632	3432	249	3442	1583
Grp Volume(v), veh/h	194	511	362	372	708	198
Grp Sat Flow(s),veh/h/ln	1774	1770	1770	1819	1721	1583
Q Serve(g_s), s	4.5	3.3	7.3	7.3	7.9	3.5
Cycle Q Clear(g_c), s	4.5	3.3	7.3	7.3	7.9	3.5
Prop In Lane	1.00			0.14	1.00	1.00
Lane Grp Cap(c), veh/h	255	1950	594	610	990	683
V/C Ratio(X)	0.76	0.26	0.61	0.61	0.72	0.29
Avail Cap(c_a), veh/h	573	2969	785	807	2151	1212
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.9	5.1	12.1	12.1	13.9	8.0
Incr Delay (d2), s/veh	1.8	0.1	1.0	1.0	0.7	0.2
Initial Q Delay(d3),s/veh	1.9	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	1.6	3.7	3.8	3.9	0.2
LnGrp Delay(d),s/veh	21.6	5.2	13.1	13.1	14.6	8.2
LnGrp LOS	C	A	B	B	B	A
Approach Vol, veh/h		705	734		906	
Approach Delay, s/veh		9.7	13.1		13.2	
Approach LOS		A	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				27.5		15.5	9.1	18.4
Change Period (Y+Rc), s				3.9		3.1	3.1	3.9
Max Green Setting (Gmax), s				36.1		26.9	13.9	19.1
Max Q Clear Time (g_c+I1), s				5.3		9.9	6.5	9.3
Green Ext Time (p_c), s				9.2		2.5	0.1	5.2

Intersection Summary	
HCM 2010 Ctrl Delay	12.1
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
2: Hopper Ave/Cleveland Ave & US 101 SB

08/08/2017

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	294	373	469	62	511	302
Future Volume (veh/h)	294	373	469	62	511	302
Number	7	4	8	18	1	16
Initial Q (Qb), veh	2	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	309	393	494	52	538	203
Adj No. of Lanes	1	2	2	0	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	386	2070	937	98	827	725
Arrive On Green	0.21	0.58	0.29	0.29	0.24	0.24
Sat Flow, veh/h	1774	3632	3326	339	3442	1583
Grp Volume(v), veh/h	309	393	270	276	538	203
Grp Sat Flow(s),veh/h/ln	1774	1770	1770	1803	1721	1583
Q Serve(g_s), s	6.6	2.1	5.1	5.1	5.6	3.2
Cycle Q Clear(g_c), s	6.6	2.1	5.1	5.1	5.6	3.2
Prop In Lane	1.00			0.19	1.00	1.00
Lane Grp Cap(c), veh/h	386	2070	513	522	827	725
V/C Ratio(X)	0.80	0.19	0.53	0.53	0.65	0.28
Avail Cap(c_a), veh/h	620	3213	850	866	2328	1411
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.9	3.9	11.9	11.9	13.7	6.7
Incr Delay (d2), s/veh	1.5	0.0	0.8	0.8	0.6	0.2
Initial Q Delay(d3),s/veh	1.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	1.0	2.6	2.7	2.7	3.5
LnGrp Delay(d),s/veh	17.4	3.9	12.8	12.8	14.3	6.9
LnGrp LOS	B	A	B	B	B	A
Approach Vol, veh/h		702	546		741	
Approach Delay, s/veh		9.8	12.8		12.3	
Approach LOS		A	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				27.1		12.7	11.6	15.5
Change Period (Y+Rc), s				3.9		3.1	3.1	3.9
Max Green Setting (Gmax), s				36.1		26.9	13.9	19.1
Max Q Clear Time (g_c+I1), s				4.1		7.6	8.6	7.1
Green Ext Time (p_c), s				6.4		2.0	0.2	4.5

Intersection Summary	
HCM 2010 Ctrl Delay	11.6
HCM 2010 LOS	B