TJKM VISION THAT MOVES YOUR COMMUNITY

TECHNICAL MEMORANDUM

Date: June 24, 2019

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From: Chris Kinzel, P.E.
Vice President

Janice Spuller
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Jurisdiction: City of Santa Rosa

Subject: ***Traffic Study for the Dutton Meadows Phase II Project in the City of Santa Rosa, CA.***

The purpose of this memorandum is to present the analysis results for the Dutton Meadows Phase II Project in the City of Santa Rosa. This project is included in the earlier analysis prepared for the *Roseland Area/Sebastopol Specific Plan (Specific Plan)* improvements in the Dutton Meadow/Hearn Area. However since Trumark Homes does not consider the Dutton Meadows plan included in the Specific Plan to be financially feasible, TJKM has analyzed slightly different scenarios in this memorandum.

The project proposes 211 unit residential development, including 130 single family dwellings and 81 accessory dwelling units, to be located east of Dutton Meadow and south of Hearn Avenue in the City of Santa Rosa.

For the purposes of this analysis, potential traffic impacts from the proposed project are identified based on established traffic operational thresholds of the City of Santa Rosa.

STUDY INTERSECTIONS AND SCENARIOS

TJKM evaluated traffic conditions at three study intersections during the a.m. and p.m. peak hours for a typical weekday. The data from W-Trans *Traffic Impact Study for the Dutton Meadows Phase II Project,* November 2018, were used during the weekday a.m. peak period and p.m. peak period at the study intersections. The study intersections are as follows:

1. Dutton Meadow/Hearn Avenue
2. Dutton Avenue/Hearn Avenue
3. Dutton Meadow/Northpoint Parkway (Future Intersection)

This study addresses the following three traffic scenarios:

- *Existing Conditions* – This evaluates existing conditions at the two study intersection using current intersection layout.
- *Existing plus Pending Projects Conditions* – This scenario is similar to Existing Conditions, but with the addition of traffic from six pending developments within the vicinity of the proposed project. This condition is also identified as Background Conditions in this report.
- *Background plus Project Conditions* – This scenario is identical to Background Conditions, but with the addition of traffic from the proposed 211 unit Phase II Dutton Meadows project development.

The Background and Background plus Project Conditions were analyzed with roadway improvements proposed by this project.

Level of Service Analysis Methodology and Significant Impact Criteria

LOS is a qualitative measure that describes operational conditions as they relate to the traffic stream and perceptions by motorists and passengers. The LOS generally describes these conditions in terms of such factors as speed and travel time, delays, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. The operational LOS are given letter designations from A to F, with A representing the best operating conditions (free-flow) and F the worst (severely-congested flow with high delays). Intersections generally are the capacity-controlling locations with respect to traffic operations on arterial and collector streets.

Signalized Intersections

The study intersections under traffic signal control were analyzed using the 2010 Highway Capacity Manual (HCM) Operations Methodology. This methodology determines LOS based on average control delay per vehicle for the overall intersection during peak-hour intersection operating conditions. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections was calculated using Synchro analysis software and was correlated to a LOS designation as shown in **Table 1**.

Roadway Impact Criteria

In general, according to the City LOS standard (minimum acceptable operations) for signalized intersections is LOS D or better along all major corridors. Exceptions to meeting this standard are allowed for facilities within downtown, where attainment would result in significant environmental degradation, where there are significant geometric constraints or where attainment would result in a loss of an area's character.

The City considers a significant impact to be satisfactorily mitigated when the measure implemented would restore LOS to Existing or Existing plus Approved Projects or better.

Table 1: Level of Service for Signalized Intersections

Level of Service	Description	Signalized (Average Control Delay per vehicle (seconds/vehicle)
A	Free flow with no delays. Users are virtually unaffected by others in the traffic stream	0 to 10
B	Stable traffic. Traffic flows smoothly with few delays	> 10 to 20
C	Stable flow but the operation of individual users becomes affected by other vehicles. Modest delays	> 20 to 35
D	Approaching unstable flow. Operation of individual users becomes significantly affected by other vehicles. Delays may be more than one cycle during peak hours	> 35 to 55
E	Unstable flow with operating conditions at or near the capacity level. Long delays and vehicle queuing	> 55 to 80
F	Forced or breakdown flow that causes reduced capacity. Stop and go traffic conditions. Excessive long delays and vehicle queuing	> 80

Source: Highway Capacity Manual, Transportation Research Board, 2010.

EXISTING CONDITIONS

In this scenario, the project study intersections are analyzed. As shown in Table 2, both existing study intersections operate within City of Santa Rosa LOS D conditions. This scenario includes existing lane configuration and existing signal timings at the study intersections. The Dutton Meadows/Hearn Avenue intersection experiences congestion, but operates at LOS D. Detailed calculation sheets for Existing Conditions are contained in **Appendix A.**

Table 2 Intersection Level of Service Analysis – Existing Conditions

#	Intersection	Control	Peak Hour	Existing Conditions	
				Average Delay[1]	LOS[2]
1	Dutton Meadow/Hearn Avenue	Signalized	AM	12.6	B
			PM	54.5	D
2	Dutton Avenue/Hearn Avenue	Signalized	AM	18.6	B
			PM	17.9	B

EXISTING PLUS PENDING PROJECT CONDITIONS

This scenario is similar to Existing Conditions, but with the addition of traffic from pending developments located within the immediate vicinity of the project.

The developer provided the list of approved and pending projects that represents the traffic volumes generated by projects that are approved but not constructed. Trip volumes were determined and added to the Future Conditions volumes to project the peak hour turning movements at the study intersections under Background Conditions. The volumes are included in **Appendix B**.

Pending Projects and Planned Developments

Pending developments located within the immediate vicinity of the project are:

- Dutton Meadow Multi-Family Residential (MFD) – 70 MFD units GPA/Rezoning from Medium to Medium High/R2 to R3
- Somerset Place - 2786 Dutton Meadow-32 Single Family Dwelling (SFD) units
- Meadowood Ranch - 2853 Dutton Meadow-78 SFD units
- Bellevue Ranch 7 – 2903 Dutton Meadow -30 units
- Lantana Place Homes – 2979 Dutton Meadow – 48 Attached SFD units
- Southwest Estates – 533 Bellevue Avenue – 60 SFD units

INTERSECTION LEVEL OF SERVICE ANALYSIS – EXISTING PLUS PENDING PROJECT CONDITIONS-

The intersection LOS analysis results for Existing plus Pending Project Conditions (Background) are summarized in **Table 3**. Detailed calculation sheets for Existing plus Approved Projects Conditions are contained in **Appendix C.** All intersections are expected to continue operating within applicable jurisdictional standards of LOS D except for the intersection of Dutton Meadow and Hearn Avenue, which operates at LOS F in the p.m. peak hour. The delay at Dutton Meadow and Hearn Avenue is due to the heavy volumes for the westbound left-turn.

The results for Existing Conditions are included for comparison purposes, along with the projected increases in delay.

Table 3 Intersection Level of Service Analysis – Existing plus Pending Project Conditions

#	Intersection	Control	Peak Hour	Existing Conditions		Existing plus Pending Project Conditions		Change in Delay[3]
				Average Delay[1]	LOS[2]	Average Delay[1]	LOS[2]	
1	Dutton Meadow/Hearn Avenue	Signalized	AM	12.6	B	15.4	B	2.8
			PM	54.5	D	**93.1**	**F**	38.6
2	Dutton Avenue/Hearn Avenue	Signalized	AM	18.6	B	18.9	B	0.3
			PM	17.9	B	19.0	B	1.1

Notes:
[1] Whole intersection weighted average control delay expressed in seconds per vehicle for signalized intersections.
[2] LOS – Level of Service calculations conducted using the Synchro 10.0 level of service analysis software package, which applies the methodology described in the HCM 2010.
[3] Change in delay between Existing and Existing plus Approved Project Conditions.

INTERSECTION LEVEL OF SERVICE ANALYSIS – BACKGROUND PLUS PROJECT CONDITIONS

This scenario is similar to the Background Conditions, but with the additions of the Project. The scenario incorporates the proposed lane configuration from the project and the inclusion of the Dutton Meadow and Northpoint Parkway intersection.

The intersection LOS analysis results for Background plus Project Conditions are summarized in **Table 4**. Detailed calculation sheets for Background plus Project Conditions are contained in **Appendix C.** All intersections are expected to continue operating within applicable jurisdictional standards of LOS D except for the intersection of Dutton Meadow and Hearn Avenue, which operates at LOS F in the p.m. peak hour.

Based on the City of Santa Rosa's impact criteria, the project is expected to have a significant impact at the study intersection of Dutton Meadow and Hearn Avenue.

The results for Background Conditions are included for comparison purposes, along with the projected increases in delay.

Table 4: Intersection Level of Service Analysis – Background plus Project Conditions

#	Intersection	Control	Peak Hour	Background Conditions		Background plus Project Conditions		Change in Delay[3]
				Average Delay[1]	LOS[2]	Average Delay[1]	LOS[2]	
1	Dutton Meadow/Hearn Avenue	Signalized	AM	15.4	B	14.9	B	-0.5
			PM	**93.1**	**F**	**90.6**	**F**	-2.5
2	Dutton Avenue/Hearn Avenue	Signalized	AM	18.9	B	13.3	B	-5.6
			PM	19.0	B	16.0	B	-3.0
3	Dutton Meadow/Northpoint Parkway	Signalized	AM	N/A		9.7	A	N/A
			PM	N/A		7.0	A	N/A

Notes:
[1] Whole intersection weighted average control delay expressed in seconds per vehicle for signalized intersections.
[2] LOS – Level of Service calculations conducted using the Synchro 10.0 level of service analysis software package, which applies the methodology described in the HCM 2010.
[3] Change in delay between Background and Background plus Project Conditions.

SITE ACCESS COMPARISONS

In terms of site access, the proposed project's roadway improvements provide a direct connection from Dutton Avenue to Northpoint Parkway adjacent to the southern edge of the site plan, instead of bisecting the site plan. As shown in **Appendix D**, the Northpoint Parkway Intersection Exhibit, there is a significant loss of 30 residential units in order to accommodate the planned improvements depicted in the Specific Plan.

In review of the data provided in the W-Trans study, it is estimated that the average daily traffic using the diagonal street is approximately 2,000 vehicles. This volume is relatively modest to justify a major roadway extension that deviates significantly from the existing roadway setting by diagonal crossing through the proposed planned development. The concern for the increase of delay at the intersection of Dutton Meadow and Hearn Avenue is alleviated by the construction of the Northpoint Parkway extension to Dutton Avenue as well as the the Tuxhorn Drive proposed extension shown in both Specific Plan and Project plans.

In terms of operations, the level of service as shown in the W-Trans study, and the details in this memorandum, shows minimal difference in delay, except in the case where this project is not

built with the improvements, and the other six pending projects are. It is unlikely the six planned improvements as described would be built without the proposed Trumark development.

The proposed project would provide a direct connection to Meadow View Elementary school, which has an enrollment of 450 students. With the pending six developments south of the project, it is likely that an increase in student enrollment would occur as these projects are built. The proposed project alignment would provide direct access to the school for both vehicle and pedestrian travel. This is preferred, and should be paired with a school traffic safety/calming program within the vicinity. The alignment also opens opportunities for grant funding for completing sidewalk gaps and implementation of a Class II Bicycle Facility on Dutton Meadow between Hearn Avenue and Bellevue Avenue. With the City planned improvements, the "X" – style roadway improvements create a barrier for pedestrians and bicycle to access the project site by having multiple crossings to reach the school from the project as well as along Dutton Meadow while increasing the speed for vehicles connecting between Dutton Meadow and Dutton Avenue. Based on this configuration, the City would have to coordinate with the school district on a site access plan to Meadow View Elementary and implement any improvements for the school.

In terms of the 90 degree turn at Northpoint Parkway to the new street connection, the roadway is able to sufficiently accommodate this movement. Though not included in the W-Trans or this study, it is anticipated that a portion the westbound trips that would turn left from Northpoint Parkway would also be diverted with some trips coming from Dutton Avenue and the new street connection. Additionally, as stated previously, the extension of Tuxhorn Drive can also serve as a connector between Dutton Meadow and Dutton Avenue; this connection does not have the 90-degree turns and a direct connection to Hearn Avenue.

The City's *Dutton Meadows Phase 2 Memorandum* is located in **Appendix E.**

CONCLUSIONS

To summarize the analysis, under Existing Conditions without the Project and with the pending six projects within the vicinity, the operating conditions at the intersection of Dutton Meadow and Hearn Avenue degrade to LOS F, failing conditions.

Under Background Conditions, the intersection of Dutton Meadow and Hearn Avenue also experiences a delay increase. Without the project, but with the Project proposed roadway improvements, the LOS in the p.m. peak period is F. With the project, under the Background plus Project Conditions, the p.m. peak period remains at LOS F, however there is a decrease in delay.

It should be noted that under Background Conditions, based on the data as well as a conservative assumption, some of the northbound trips on Dutton Meadow would utilize the new Northpoint Parkway extension and the new Dutton Avenue to access the eastbound lanes of Hearn Avenue.

Given the future forecasted volumes, the volumes anticipated are fairly modest (approximately 2,000 vehicles per day) to justify such extensive roadway improvements. Without the project, and the proposed roadway improvements as part of the project, there is no reliever connector to Hearn via the proposed Northpoint Parkway and the new Street to Dutton Avenue.

In terms of pedestrian and bicycle access, the City planned improvements can create a barrier to existing destinations particularly Meadow View Elementary School. With the six pending residential projects in the immediate vicinity, an increase of pedestrians, bicyclists, and vehicles would benefit from direct access to the school.

There are two additional options to connect between Dutton Meadow and Dutton Avenue: the extension of Northpoint Parkway to the new street connection as the project proposed and the Tuxhorn Drive planned extension, which is included in both City and project proposed plans. These connections benefit the vicinity without the loss of dwelling units.

Appendix A – Existing Conditions Synchro Levels of Service Analysis Results

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	604	317	429	103	402
v/c Ratio	0.73	0.67	0.29	0.35	0.53
Control Delay	21.8	29.6	3.3	29.5	9.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	29.6	3.3	29.5	9.9
Queue Length 50th (ft)	180	115	38	38	61
Queue Length 95th (ft)	#395	208	83	84	127
Internal Link Dist (ft)	672		1604	449	
Turn Bay Length (ft)		60		150	
Base Capacity (vph)	1034	664	1582	831	860
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.58	0.48	0.27	0.12	0.47

Intersection Summary

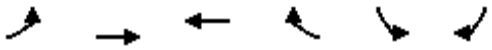
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	477	79	292	395	95	370
Future Volume (veh/h)	477	79	292	395	95	370
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	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	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	518	86	317	429	103	402
Adj No. of Lanes	1	0	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	643	107	386	1318	267	582
Arrive On Green	0.41	0.41	0.22	0.71	0.15	0.15
Sat Flow, veh/h	1558	259	1774	1863	1774	1583
Grp Volume(v), veh/h	0	604	317	429	103	402
Grp Sat Flow(s),veh/h/ln	0	1817	1774	1863	1774	1583
Q Serve(g_s), s	0.0	13.6	7.9	4.1	2.4	0.0
Cycle Q Clear(g_c), s	0.0	13.6	7.9	4.1	2.4	0.0
Prop In Lane		0.14	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	0	750	386	1318	267	582
V/C Ratio(X)	0.00	0.81	0.82	0.33	0.39	0.69
Avail Cap(c_a), veh/h	0	1173	764	1318	955	1196
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	12.0	17.3	2.6	17.8	12.4
Incr Delay (d2), s/veh	0.0	2.3	1.7	0.1	0.9	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	7.2	4.1	2.1	1.2	4.5
LnGrp Delay(d),s/veh	0.0	14.3	19.0	2.7	18.7	13.9
LnGrp LOS		B	B	A	B	B
Approach Vol, veh/h	604			746	505	
Approach Delay, s/veh	14.3			9.6	14.9	
Approach LOS	B			A	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	13.7	22.8				36.5		10.0
Change Period (Y+Rc), s	3.6	* 3.6				3.6		3.0
Max Green Setting (Gmax), s	20.0	* 30				30.0		25.0
Max Q Clear Time (g_c+I1), s	9.9	15.6				6.1		4.4
Green Ext Time (p_c), s	0.4	3.6				2.7		1.7

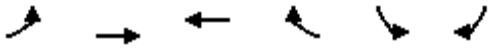
Intersection Summary	
HCM 2010 Ctrl Delay	12.6
HCM 2010 LOS	B

Notes



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	116	740	567	264	327	121
v/c Ratio	0.63	0.56	0.54	0.19	0.78	0.18
Control Delay	61.4	11.3	19.6	0.6	52.1	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.4	11.3	19.6	0.6	52.1	3.7
Queue Length 50th (ft)	80	227	237	0	217	0
Queue Length 95th (ft)	134	423	442	14	288	30
Internal Link Dist (ft)		1604	668		890	
Turn Bay Length (ft)	150			205	200	
Base Capacity (vph)	258	1310	1054	1504	633	719
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.45	0.56	0.54	0.18	0.52	0.17

Intersection Summary



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	107	681	522	243	301	111
Future Volume (veh/h)	107	681	522	243	301	111
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	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	1863	1863	1863
Adj Flow Rate, veh/h	116	740	567	264	327	121
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	143	1361	1150	1309	371	459
Arrive On Green	0.08	0.73	0.62	0.62	0.21	0.21
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	116	740	567	264	327	121
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	7.1	19.5	18.4	3.8	19.7	6.5
Cycle Q Clear(g_c), s	7.1	19.5	18.4	3.8	19.7	6.5
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	143	1361	1150	1309	371	459
V/C Ratio(X)	0.81	0.54	0.49	0.20	0.88	0.26
Avail Cap(c_a), veh/h	258	1361	1150	1309	635	695
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.72	0.72	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.7	6.6	11.6	2.0	42.2	30.0
Incr Delay (d2), s/veh	3.0	1.1	1.5	0.3	7.5	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	10.3	9.9	3.8	10.4	6.3
LnGrp Delay(d),s/veh	52.7	7.7	13.1	2.3	49.7	30.3
LnGrp LOS	D	A	B	A	D	C
Approach Vol, veh/h		856	831		448	
Approach Delay, s/veh		13.8	9.7		44.5	
Approach LOS		B	A		D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		84.0		26.0	12.5	71.5		
Change Period (Y+Rc), s		3.6		3.0	3.6	3.6		
Max Green Setting (Gmax), s		64.0		39.4	16.0	44.4		
Max Q Clear Time (g_c+I1), s		21.5		21.7	9.1	20.4		
Green Ext Time (p_c), s		6.4		1.4	0.1	4.9		

Intersection Summary	
HCM 2010 Ctrl Delay	18.6
HCM 2010 LOS	B

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1049	124	595	288	182
v/c Ratio	1.24	0.48	0.49	0.68	0.25
Control Delay	140.4	33.6	8.1	31.1	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	140.4	33.6	8.1	31.1	7.0
Queue Length 50th (ft)	~517	46	98	102	22
Queue Length 95th (ft)	#930	102	225	188	54
Internal Link Dist (ft)	672		1604	449	
Turn Bay Length (ft)		60		150	
Base Capacity (vph)	844	549	1531	686	731
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	1.24	0.23	0.39	0.42	0.25

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

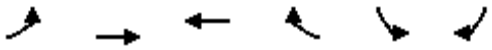
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	632	333	114	547	265	167
Future Volume (veh/h)	632	333	114	547	265	167
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	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	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	687	362	124	595	288	182
Adj No. of Lanes	1	0	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	590	311	184	1263	371	495
Arrive On Green	0.51	0.51	0.10	0.68	0.21	0.21
Sat Flow, veh/h	1150	606	1774	1863	1774	1583
Grp Volume(v), veh/h	0	1049	124	595	288	182
Grp Sat Flow(s),veh/h/ln	0	1756	1774	1863	1774	1583
Q Serve(g_s), s	0.0	30.0	3.9	8.8	9.0	0.0
Cycle Q Clear(g_c), s	0.0	30.0	3.9	8.8	9.0	0.0
Prop In Lane		0.35	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	0	900	184	1263	371	495
V/C Ratio(X)	0.00	1.17	0.67	0.47	0.78	0.37
Avail Cap(c_a), veh/h	0	900	606	1263	758	841
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	14.3	25.3	4.5	21.8	15.6
Incr Delay (d2), s/veh	0.0	86.5	1.6	0.3	3.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	35.9	2.0	4.6	4.8	2.3
LnGrp Delay(d),s/veh	0.0	100.7	26.9	4.7	25.3	16.1
LnGrp LOS		F	C	A	C	B
Approach Vol, veh/h	1049			719	470	
Approach Delay, s/veh	100.7			8.6	21.7	
Approach LOS	F			A	C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	9.7	33.6				43.3		15.2
Change Period (Y+Rc), s	3.6	* 3.6				3.6		3.0
Max Green Setting (Gmax), s	20.0	* 30				30.0		25.0
Max Q Clear Time (g_c+I1), s	5.9	32.0				10.8		11.0
Green Ext Time (p_c), s	0.1	0.0				3.9		1.3

Intersection Summary	
HCM 2010 Ctrl Delay	54.5
HCM 2010 LOS	D

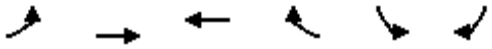
Notes



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	124	585	739	383	280	177
v/c Ratio	0.61	0.43	0.68	0.29	0.75	0.27
Control Delay	58.6	8.0	22.6	1.8	52.6	7.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.6	8.0	22.6	1.8	52.6	7.4
Queue Length 50th (ft)	84	140	342	22	187	22
Queue Length 95th (ft)	141	268	#677	51	255	57
Internal Link Dist (ft)		1604	668		890	
Turn Bay Length (ft)	150			205	200	
Base Capacity (vph)	210	1357	1082	1513	633	649
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.43	0.68	0.25	0.44	0.27

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	114	538	680	352	258	163
Future Volume (veh/h)	114	538	680	352	258	163
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	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	1863	1863	1863
Adj Flow Rate, veh/h	124	585	739	383	280	177
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	151	1408	1189	1302	327	426
Arrive On Green	0.09	0.76	0.64	0.64	0.18	0.18
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	124	585	739	383	280	177
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	7.6	12.3	26.2	6.2	16.8	10.1
Cycle Q Clear(g_c), s	7.6	12.3	26.2	6.2	16.8	10.1
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	151	1408	1189	1302	327	426
V/C Ratio(X)	0.82	0.42	0.62	0.29	0.86	0.42
Avail Cap(c_a), veh/h	161	1408	1189	1302	635	702
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.09	0.09	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.5	4.8	11.9	2.3	43.5	33.1
Incr Delay (d2), s/veh	2.8	0.1	2.5	0.6	6.5	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.8	6.2	14.2	5.7	8.8	9.4
LnGrp Delay(d),s/veh	52.3	4.9	14.4	2.9	49.9	33.7
LnGrp LOS	D	A	B	A	D	C
Approach Vol, veh/h		709	1122		457	
Approach Delay, s/veh		13.2	10.5		43.7	
Approach LOS		B	B		D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		86.7		23.3	13.0	73.8		
Change Period (Y+Rc), s		3.6		3.0	3.6	3.6		
Max Green Setting (Gmax), s		64.0		39.4	10.0	50.4		
Max Q Clear Time (g_c+I1), s		14.3		18.8	9.6	28.2		
Green Ext Time (p_c), s		4.6		1.4	0.0	7.1		

Intersection Summary	
HCM 2010 Ctrl Delay	17.9
HCM 2010 LOS	B

Appendix B – Existing plus Pending Projects Conditions Synchro Levels of Service Analysis Results

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	611	362	436	129	537
v/c Ratio	0.76	0.72	0.29	0.43	0.67
Control Delay	24.6	32.6	3.6	31.5	14.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	24.6	32.6	3.6	31.5	14.0
Queue Length 50th (ft)	212	139	43	52	112
Queue Length 95th (ft)	#419	#275	94	100	209
Internal Link Dist (ft)	672		1604	449	
Turn Bay Length (ft)		60		150	
Base Capacity (vph)	952	612	1509	765	871
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.64	0.59	0.29	0.17	0.62

Intersection Summary

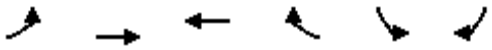
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	477	86	333	401	119	494
Future Volume (veh/h)	477	86	333	401	119	494
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	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	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	518	93	362	436	129	537
Adj No. of Lanes	1	0	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	625	112	426	1335	275	625
Arrive On Green	0.41	0.41	0.24	0.72	0.15	0.15
Sat Flow, veh/h	1538	276	1774	1863	1774	1583
Grp Volume(v), veh/h	0	611	362	436	129	537
Grp Sat Flow(s),veh/h/ln	0	1814	1774	1863	1774	1583
Q Serve(g_s), s	0.0	15.5	10.0	4.4	3.4	3.6
Cycle Q Clear(g_c), s	0.0	15.5	10.0	4.4	3.4	3.6
Prop In Lane		0.15	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	0	737	426	1335	275	625
V/C Ratio(X)	0.00	0.83	0.85	0.33	0.47	0.86
Avail Cap(c_a), veh/h	0	1060	691	1335	864	1151
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	13.6	18.6	2.7	19.8	14.2
Incr Delay (d2), s/veh	0.0	3.8	2.9	0.1	1.2	3.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	8.4	5.2	2.2	1.7	6.9
LnGrp Delay(d),s/veh	0.0	17.4	21.5	2.8	21.0	17.8
LnGrp LOS		B	C	A	C	B
Approach Vol, veh/h	611			798	666	
Approach Delay, s/veh	17.4			11.3	18.4	
Approach LOS	B			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	15.9	24.5				40.4		11.0
Change Period (Y+Rc), s	3.6	* 3.6				3.6		3.0
Max Green Setting (Gmax), s	20.0	* 30				30.0		25.0
Max Q Clear Time (g_c+I1), s	12.0	17.5				6.4		5.6
Green Ext Time (p_c), s	0.4	3.4				2.8		2.3

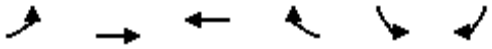
Intersection Summary	
HCM 2010 Ctrl Delay	15.4
HCM 2010 LOS	B

Notes



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	132	860	607	264	327	126
v/c Ratio	0.66	0.66	0.58	0.20	0.78	0.19
Control Delay	61.4	13.4	21.4	0.7	52.1	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.4	13.4	21.4	0.7	52.1	3.5
Queue Length 50th (ft)	91	295	267	0	217	0
Queue Length 95th (ft)	148	555	498	15	288	30
Internal Link Dist (ft)		1604	668		890	
Turn Bay Length (ft)	150			205	200	
Base Capacity (vph)	262	1310	1038	1495	633	726
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.66	0.58	0.18	0.52	0.17

Intersection Summary



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	121	791	558	243	301	116
Future Volume (veh/h)	121	791	558	243	301	116
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	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	1863	1863	1863
Adj Flow Rate, veh/h	132	860	607	264	327	126
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	160	1361	1132	1293	371	475
Arrive On Green	0.09	0.73	0.61	0.61	0.21	0.21
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	132	860	607	264	327	126
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	8.0	25.4	20.9	4.0	19.7	6.7
Cycle Q Clear(g_c), s	8.0	25.4	20.9	4.0	19.7	6.7
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	160	1361	1132	1293	371	475
V/C Ratio(X)	0.82	0.63	0.54	0.20	0.88	0.27
Avail Cap(c_a), veh/h	258	1361	1132	1293	635	710
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.62	0.62	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.2	7.4	12.6	2.2	42.2	29.3
Incr Delay (d2), s/veh	3.2	1.4	1.8	0.4	7.5	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.1	13.4	11.2	3.9	10.4	6.6
LnGrp Delay(d),s/veh	52.3	8.8	14.4	2.6	49.6	29.6
LnGrp LOS	D	A	B	A	D	C
Approach Vol, veh/h		992	871		453	
Approach Delay, s/veh		14.6	10.8		44.1	
Approach LOS		B	B		D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		84.0		26.0	13.5	70.4		
Change Period (Y+Rc), s		3.6		3.0	3.6	3.6		
Max Green Setting (Gmax), s		64.0		39.4	16.0	44.4		
Max Q Clear Time (g_c+I1), s		27.4		21.7	10.0	22.9		
Green Ext Time (p_c), s		8.1		1.4	0.1	5.2		

Intersection Summary	
HCM 2010 Ctrl Delay	18.9
HCM 2010 LOS	B

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1086	271	598	303	271
v/c Ratio	1.42	0.75	0.48	0.71	0.33
Control Delay	217.9	41.6	8.3	35.7	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	217.9	41.6	8.3	35.7	8.3
Queue Length 50th (ft)	~674	114	112	124	46
Queue Length 95th (ft)	#1090	213	236	219	88
Internal Link Dist (ft)	672		1604	449	
Turn Bay Length (ft)		60		150	
Base Capacity (vph)	767	496	1385	621	803
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	1.42	0.55	0.43	0.49	0.34

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

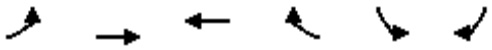
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	639	360	249	550	279	249
Future Volume (veh/h)	639	360	249	550	279	249
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	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	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	695	391	271	598	303	271
Adj No. of Lanes	1	0	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	505	284	320	1277	382	627
Arrive On Green	0.45	0.45	0.18	0.69	0.22	0.22
Sat Flow, veh/h	1121	631	1774	1863	1774	1583
Grp Volume(v), veh/h	0	1086	271	598	303	271
Grp Sat Flow(s),veh/h/ln	0	1751	1774	1863	1774	1583
Q Serve(g_s), s	0.0	30.0	9.8	9.9	10.8	0.0
Cycle Q Clear(g_c), s	0.0	30.0	9.8	9.9	10.8	0.0
Prop In Lane		0.36	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	0	790	320	1277	382	627
V/C Ratio(X)	0.00	1.37	0.85	0.47	0.79	0.43
Avail Cap(c_a), veh/h	0	790	533	1277	667	881
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	18.3	26.4	4.8	24.7	14.7
Incr Delay (d2), s/veh	0.0	176.7	2.8	0.3	3.8	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	53.0	5.1	5.1	5.6	3.6
LnGrp Delay(d),s/veh	0.0	195.0	29.2	5.1	28.5	15.1
LnGrp LOS		F	C	A	C	B
Approach Vol, veh/h	1086			869	574	
Approach Delay, s/veh	195.0			12.6	22.2	
Approach LOS	F			B	C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	15.6	33.6				49.2		17.3
Change Period (Y+Rc), s	3.6	* 3.6				3.6		3.0
Max Green Setting (Gmax), s	20.0	* 30				30.0		25.0
Max Q Clear Time (g_c+I1), s	11.8	32.0				11.9		12.8
Green Ext Time (p_c), s	0.3	0.0				3.8		1.6

Intersection Summary	
HCM 2010 Ctrl Delay	93.1
HCM 2010 LOS	F

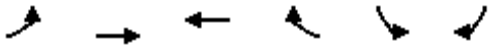
Notes



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	134	664	868	383	280	195
v/c Ratio	0.61	0.49	0.82	0.29	0.75	0.31
Control Delay	57.3	8.7	29.0	2.2	52.6	12.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.3	8.7	29.0	2.2	52.6	12.9
Queue Length 50th (ft)	91	169	466	27	187	51
Queue Length 95th (ft)	150	322	#886	58	255	86
Internal Link Dist (ft)		1604	668		890	
Turn Bay Length (ft)	150			205	200	
Base Capacity (vph)	222	1357	1065	1504	633	633
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.49	0.82	0.25	0.44	0.31

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	123	611	799	352	258	179
Future Volume (veh/h)	123	611	799	352	258	179
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	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	1863	1863	1863
Adj Flow Rate, veh/h	134	664	868	383	280	195
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	161	1407	1177	1293	328	436
Arrive On Green	0.09	0.76	0.63	0.63	0.18	0.18
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	134	664	868	383	280	195
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	8.2	14.9	35.4	6.4	16.8	11.2
Cycle Q Clear(g_c), s	8.2	14.9	35.4	6.4	16.8	11.2
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	161	1407	1177	1293	328	436
V/C Ratio(X)	0.83	0.47	0.74	0.30	0.85	0.45
Avail Cap(c_a), veh/h	161	1407	1177	1293	635	711
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.09	0.09	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.2	5.1	14.0	2.4	43.4	32.9
Incr Delay (d2), s/veh	3.3	0.1	4.2	0.6	6.4	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.2	7.6	19.4	5.8	8.8	10.3
LnGrp Delay(d),s/veh	52.4	5.2	18.1	3.0	49.8	33.6
LnGrp LOS	D	A	B	A	D	C
Approach Vol, veh/h		798	1251		475	
Approach Delay, s/veh		13.1	13.5		43.1	
Approach LOS		B	B		D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		86.7		23.3	13.6	73.1		
Change Period (Y+Rc), s		3.6		3.0	3.6	3.6		
Max Green Setting (Gmax), s		64.0		39.4	10.0	50.4		
Max Q Clear Time (g_c+I1), s		16.9		18.8	10.2	37.4		
Green Ext Time (p_c), s		5.5		1.5	0.0	6.5		

Intersection Summary	
HCM 2010 Ctrl Delay	19.0
HCM 2010 LOS	B

Appendix C –Background plus Project Conditions Synchro Levels of Service Analysis Results

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	618	353	439	136	509
v/c Ratio	0.76	0.72	0.30	0.44	0.64
Control Delay	24.8	33.0	3.7	31.6	13.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	24.8	33.0	3.7	31.6	13.0
Queue Length 50th (ft)	213	136	45	54	100
Queue Length 95th (ft)	#431	#268	98	104	189
Internal Link Dist (ft)	672		1604	460	
Turn Bay Length (ft)		60		150	
Base Capacity (vph)	948	610	1506	762	858
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.65	0.58	0.29	0.18	0.59

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	478	90	325	404	125	468
Future Volume (veh/h)	478	90	325	404	125	468
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	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	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	520	98	353	439	136	509
Adj No. of Lanes	1	0	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	627	118	417	1336	272	615
Arrive On Green	0.41	0.41	0.24	0.72	0.15	0.15
Sat Flow, veh/h	1525	287	1774	1863	1774	1583
Grp Volume(v), veh/h	0	618	353	439	136	509
Grp Sat Flow(s),veh/h/ln	0	1812	1774	1863	1774	1583
Q Serve(g_s), s	0.0	15.5	9.7	4.4	3.6	2.8
Cycle Q Clear(g_c), s	0.0	15.5	9.7	4.4	3.6	2.8
Prop In Lane		0.16	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	0	745	417	1336	272	615
V/C Ratio(X)	0.00	0.83	0.85	0.33	0.50	0.83
Avail Cap(c_a), veh/h	0	1067	697	1336	871	1150
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	13.4	18.6	2.7	19.8	14.0
Incr Delay (d2), s/veh	0.0	3.8	2.1	0.1	1.4	2.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	8.5	5.0	2.2	1.8	6.4
LnGrp Delay(d),s/veh	0.0	17.2	20.7	2.8	21.2	17.0
LnGrp LOS		B	C	A	C	B
Approach Vol, veh/h	618			792	645	
Approach Delay, s/veh	17.2			10.8	17.9	
Approach LOS	B			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	15.6	24.5				40.1		10.8
Change Period (Y+Rc), s	3.6	* 3.6				3.6		3.0
Max Green Setting (Gmax), s	20.0	* 30				30.0		25.0
Max Q Clear Time (g_c+I1), s	11.7	17.5				6.4		5.6
Green Ext Time (p_c), s	0.4	3.4				2.8		2.2

Intersection Summary	
HCM 2010 Ctrl Delay	14.9
HCM 2010 LOS	B

Notes

Lane Group	EBL	EBT	WBT	WBR	NBT	SBT	SBR
Lane Group Flow (vph)	132	849	631	264	104	329	127
v/c Ratio	0.68	0.79	no cap	0.25	1.21	1.72	0.15
Control Delay	64.4	25.0		2.5	179.0	378.6	2.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	64.4	25.0	Error	2.5	179.0	378.6	2.7
Queue Length 50th (ft)	91	440	~929	0	~27	~426	0
Queue Length 95th (ft)	151	624	#1149	41	#138	#602	28
Internal Link Dist (ft)		1604	668		369	890	
Turn Bay Length (ft)	150			205			
Base Capacity (vph)	247	1073	1	1092	86	191	898
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.79	631.00	0.24	1.21	1.72	0.14

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	121	781	0	26	555	243	6	10	79	301	2	117
Future Volume (veh/h)	121	781	0	26	555	243	6	10	79	301	2	117
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	1900	1863	1863	1900	1863	1900	1900	1863	1863
Adj Flow Rate, veh/h	132	849	0	28	603	264	7	11	86	327	2	127
Adj No. of Lanes	1	1	0	0	1	1	0	1	0	0	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	160	1570	0	0	1351	1105	0	17	129	0	169	287
Arrive On Green	0.09	0.84	0.00	0.00	0.73	0.73	0.00	0.09	0.09	0.00	0.09	0.09
Sat Flow, veh/h	1774	1863	0	0	1863	1583	0	183	1428	0	1863	1583
Grp Volume(v), veh/h	132	849	0	0	603	264	0	0	97	0	2	127
Grp Sat Flow(s),veh/h/ln	1774	1863	0	0	1863	1583	0	0	1611	0	1863	1583
Q Serve(g_s), s	8.0	14.5	0.0	0.0	14.5	9.6	0.0	0.0	6.4	0.0	0.1	7.9
Cycle Q Clear(g_c), s	8.0	14.5	0.0	0.0	14.5	9.6	0.0	0.0	6.4	0.0	0.1	7.9
Prop In Lane	1.00		0.00	0.00		1.00	0.00		0.89	0.00		1.00
Lane Grp Cap(c), veh/h	160	1570	0	0	1351	1105	0	0	146	0	169	287
V/C Ratio(X)	0.82	0.54	0.00	0.00	0.45	0.24	0.00	0.00	0.66	0.00	0.01	0.44
Avail Cap(c_a), veh/h	248	1570	0	0	1351	1105	0	0	366	0	423	503
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)	0.64	0.64	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	49.2	2.5	0.0	0.0	6.1	11.7	0.0	0.0	48.4	0.0	45.5	40.1
Incr Delay (d2), s/veh	4.4	0.9	0.0	0.0	1.1	0.5	0.0	0.0	1.9	0.0	0.0	1.1
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	4.2	7.4	0.0	0.0	7.8	4.4	0.0	0.0	2.9	0.0	0.1	3.5
LnGrp Delay(d),s/veh	53.6	3.4	0.0	0.0	7.2	12.2	0.0	0.0	50.3	0.0	45.6	41.2
LnGrp LOS	D	A			A	B			D		D	D
Approach Vol, veh/h		981			867			97			129	
Approach Delay, s/veh		10.1			8.7			50.3			41.3	
Approach LOS		B			A			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	96.4	0.0	13.6	12.9	83.5	0.0	13.6
Change Period (Y+Rc), s	3.0	3.7	3.0	3.6	3.0	3.7	3.0	3.6
Max Green Setting (Gmax), s	15.4	45.0	11.3	25.0	15.4	45.0	11.3	25.0
Max Q Clear Time (g_c+I1), s	0.0	16.5	0.0	9.9	10.0	16.5	0.0	8.4
Green Ext Time (p_c), s	0.0	7.4	0.0	0.3	0.1	5.5	0.0	0.3

Intersection Summary	
HCM 2010 Ctrl Delay	13.3
HCM 2010 LOS	B

Lane Group	EBL	EBT	WBT	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	76	46	9	13	637	4	371
v/c Ratio	0.34	0.06	0.06	0.05	0.47	0.03	0.26
Control Delay	30.4	0.2	28.2	0.4	9.1	28.2	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.4	0.2	28.2	0.4	9.1	28.2	4.6
Queue Length 50th (ft)	27	0	3	0	67	1	32
Queue Length 95th (ft)	67	0	17	0	#380	10	126
Internal Link Dist (ft)		207	514		400		460
Turn Bay Length (ft)						175	
Base Capacity (vph)	490	869	490	575	1366	545	1427
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.05	0.02	0.02	0.47	0.01	0.26

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	0	42	8	0	12	0	554	32	4	341	0
Future Volume (veh/h)	70	0	42	8	0	12	0	554	32	4	341	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	1900	1863	1863	0	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	76	0	46	9	0	13	0	602	35	4	371	0
Adj No. of Lanes	1	1	0	0	1	1	0	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	129	0	115	45	0	49	0	1097	64	10	1307	0
Arrive On Green	0.07	0.00	0.07	0.03	0.00	0.03	0.00	0.63	0.63	0.01	0.70	0.00
Sat Flow, veh/h	1774	0	1583	1774	0	1583	0	1743	101	1774	1863	0
Grp Volume(v), veh/h	76	0	46	9	0	13	0	0	637	4	371	0
Grp Sat Flow(s),veh/h/ln	1774	0	1583	1774	0	1583	0	0	1845	1774	1863	0
Q Serve(g_s), s	2.5	0.0	1.7	0.3	0.0	0.5	0.0	0.0	11.7	0.1	4.4	0.0
Cycle Q Clear(g_c), s	2.5	0.0	1.7	0.3	0.0	0.5	0.0	0.0	11.7	0.1	4.4	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.00		0.05	1.00		0.00
Lane Grp Cap(c), veh/h	129	0	115	45	0	49	0	0	1161	10	1307	0
V/C Ratio(X)	0.59	0.00	0.40	0.20	0.00	0.27	0.00	0.00	0.55	0.42	0.28	0.00
Avail Cap(c_a), veh/h	533	0	476	533	0	485	0	0	1161	593	1307	0
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	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	26.9	0.0	26.5	28.6	0.0	28.3	0.0	0.0	6.3	29.7	3.3	0.0
Incr Delay (d2), s/veh	4.3	0.0	2.2	2.1	0.0	2.8	0.0	0.0	1.9	26.7	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	0.8	0.2	0.0	0.2	0.0	0.0	6.4	0.1	2.5	0.0
LnGrp Delay(d),s/veh	31.2	0.0	28.8	30.7	0.0	31.2	0.0	0.0	8.2	56.4	3.9	0.0
LnGrp LOS	C		C	C		C			A	E	A	
Approach Vol, veh/h		122			22			637			375	
Approach Delay, s/veh		30.3			31.0			8.2			4.4	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	4.3	41.7		8.3		46.0		5.5
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s	20.0	18.0		18.0		42.0		18.0
Max Q Clear Time (g_c+I1), s	2.1	13.7		4.5		6.4		2.5
Green Ext Time (p_c), s	0.0	1.6		0.3		2.3		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	9.7
HCM 2010 LOS	A

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1096	240	600	308	252
v/c Ratio	1.41	0.70	0.49	0.72	0.32
Control Delay	213.8	39.5	8.4	35.3	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	213.8	39.5	8.4	35.3	8.0
Queue Length 50th (ft)	~662	99	111	123	41
Queue Length 95th (ft)	#1101	187	238	222	80
Internal Link Dist (ft)	672		1604	460	
Turn Bay Length (ft)		60		150	
Base Capacity (vph)	778	504	1406	630	798
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	1.41	0.48	0.43	0.49	0.32

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	642	366	221	552	283	232
Future Volume (veh/h)	642	366	221	552	283	232
Number	2	12	1	6	3	18
Initial Q (Qb), veh	0	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	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	698	398	240	600	308	252
Adj No. of Lanes	1	0	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	515	293	290	1267	387	604
Arrive On Green	0.46	0.46	0.16	0.68	0.22	0.22
Sat Flow, veh/h	1115	636	1774	1863	1774	1583
Grp Volume(v), veh/h	0	1096	240	600	308	252
Grp Sat Flow(s),veh/h/ln	0	1751	1774	1863	1774	1583
Q Serve(g_s), s	0.0	30.0	8.5	9.9	10.7	0.0
Cycle Q Clear(g_c), s	0.0	30.0	8.5	9.9	10.7	0.0
Prop In Lane		0.36	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	0	808	290	1267	387	604
V/C Ratio(X)	0.00	1.36	0.83	0.47	0.80	0.42
Avail Cap(c_a), veh/h	0	808	546	1267	682	867
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	17.5	26.3	4.9	24.0	14.8
Incr Delay (d2), s/veh	0.0	168.5	2.3	0.3	3.8	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	52.2	4.3	5.1	5.6	3.3
LnGrp Delay(d),s/veh	0.0	186.0	28.7	5.2	27.8	15.2
LnGrp LOS		F	C	A	C	B
Approach Vol, veh/h	1096			840	560	
Approach Delay, s/veh	186.0			11.9	22.1	
Approach LOS	F			B	C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	14.2	33.6				47.8		17.2
Change Period (Y+Rc), s	3.6	* 3.6				3.6		3.0
Max Green Setting (Gmax), s	20.0	* 30				30.0		25.0
Max Q Clear Time (g_c+I1), s	10.5	32.0				11.9		12.7
Green Ext Time (p_c), s	0.2	0.0				3.9		1.5

Intersection Summary	
HCM 2010 Ctrl Delay	90.6
HCM 2010 LOS	F

Notes

Lane Group	EBL	EBT	WBT	WBR	NBT	SBT	SBR
Lane Group Flow (vph)	134	665	951	383	67	292	195
v/c Ratio	0.89	0.62	no cap	0.35	1.18	1.51	0.23
Control Delay	99.1	18.6		4.0	192.1	290.2	3.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	99.1	18.6	Error	4.0	192.1	290.2	3.0
Queue Length 50th (ft)	95	292	~1401	26	~15	~369	0
Queue Length 95th (ft)	#211	411	#1645	73	#108	#536	38
Internal Link Dist (ft)		1604	668		369	890	
Turn Bay Length (ft)	150			205			
Base Capacity (vph)	151	1071	1	1137	57	193	854
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.89	0.62	951.00	0.34	1.18	1.51	0.23

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	123	604	7	86	789	352	3	6	52	258	11	179
Future Volume (veh/h)	123	604	7	86	789	352	3	6	52	258	11	179
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	1900	1863	1863	1900	1863	1900	1900	1863	1863
Adj Flow Rate, veh/h	134	657	8	93	858	383	3	7	57	280	12	195
Adj No. of Lanes	1	1	0	0	1	1	0	1	0	0	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	152	1472	18	0	1283	1047	0	23	190	0	247	345
Arrive On Green	0.09	0.80	0.80	0.00	0.69	0.69	0.00	0.13	0.13	0.00	0.13	0.13
Sat Flow, veh/h	1774	1836	22	0	1863	1583	0	176	1434	0	1863	1583
Grp Volume(v), veh/h	134	0	665	0	858	383	0	0	64	0	12	195
Grp Sat Flow(s),veh/h/ln	1774	0	1859	0	1863	1583	0	0	1610	0	1863	1583
Q Serve(g_s), s	8.2	0.0	12.2	0.0	29.3	14.9	0.0	0.0	4.0	0.0	0.6	12.1
Cycle Q Clear(g_c), s	8.2	0.0	12.2	0.0	29.3	14.9	0.0	0.0	4.0	0.0	0.6	12.1
Prop In Lane	1.00		0.01	0.00		1.00	0.00		0.89	0.00		1.00
Lane Grp Cap(c), veh/h	152	0	1489	0	1283	1047	0	0	213	0	247	345
V/C Ratio(X)	0.88	0.00	0.45	0.00	0.67	0.37	0.00	0.00	0.30	0.00	0.05	0.57
Avail Cap(c_a), veh/h	152	0	1489	0	1283	1047	0	0	366	0	423	495
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)	0.09	0.00	0.09	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	49.8	0.0	3.4	0.0	9.9	12.7	0.0	0.0	43.1	0.0	41.7	38.4
Incr Delay (d2), s/veh	5.8	0.0	0.1	0.0	2.8	1.0	0.0	0.0	0.3	0.0	0.1	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	0.0	6.1	0.0	15.8	6.7	0.0	0.0	1.8	0.0	0.3	5.4
LnGrp Delay(d),s/veh	55.5	0.0	3.5	0.0	12.7	13.6	0.0	0.0	43.4	0.0	41.8	39.8
LnGrp LOS	E		A		B	B			D		D	D
Approach Vol, veh/h		799			1241			64			207	
Approach Delay, s/veh		12.2			13.0			43.4			39.9	
Approach LOS		B			B			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	91.8	0.0	18.2	12.4	79.4	0.0	18.2
Change Period (Y+Rc), s	3.0	3.7	3.0	3.6	3.0	3.7	3.0	3.6
Max Green Setting (Gmax), s	9.4	51.0	11.3	25.0	9.4	51.0	11.3	25.0
Max Q Clear Time (g_c+I1), s	0.0	14.2	0.0	14.1	10.2	31.3	0.0	6.0
Green Ext Time (p_c), s	0.0	5.4	0.0	0.5	0.0	8.1	0.0	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	16.0
HCM 2010 LOS	B

Lane Group	EBL	EBT	WBT	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	9	4	38	8	571	14	616
v/c Ratio	0.06	0.01	0.21	0.02	0.39	0.09	0.40
Control Delay	29.0	0.0	30.0	0.1	7.1	29.2	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Delay	29.0	0.0	30.0	0.1	7.1	29.2	4.8
Queue Length 50th (ft)	4	0	16	0	51	6	57
Queue Length 95th (ft)	17	0	40	0	297	21	219
Internal Link Dist (ft)		207	514		400		460
Turn Bay Length (ft)						175	
Base Capacity (vph)	490	732	490	685	1481	544	1548
Starvation Cap Reductn	0	0	0	0	0	0	292
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.01	0.08	0.01	0.39	0.03	0.49

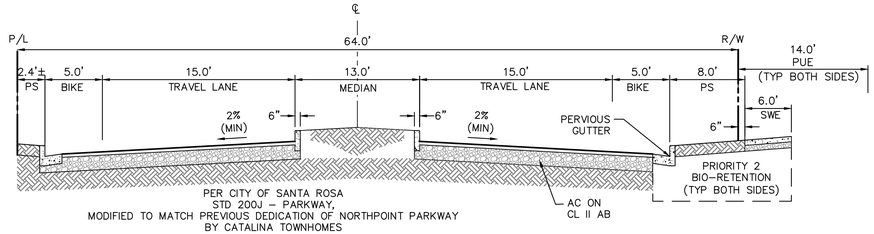
Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	0	4	35	0	7	0	505	20	13	567	0
Future Volume (veh/h)	8	0	4	35	0	7	0	505	20	13	567	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
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	1900	1863	1863	0	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	9	0	4	38	0	8	0	549	22	14	616	0
Adj No. of Lanes	1	1	0	0	1	1	0	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	0
Cap, veh/h	29	0	26	80	0	99	0	1144	46	31	1360	0
Arrive On Green	0.02	0.00	0.02	0.05	0.00	0.05	0.00	0.64	0.64	0.02	0.73	0.00
Sat Flow, veh/h	1774	0	1583	1774	0	1583	0	1779	71	1774	1863	0
Grp Volume(v), veh/h	9	0	4	38	0	8	0	0	571	14	616	0
Grp Sat Flow(s),veh/h/ln	1774	0	1583	1774	0	1583	0	0	1850	1774	1863	0
Q Serve(g_s), s	0.3	0.0	0.1	1.2	0.0	0.3	0.0	0.0	9.2	0.4	7.7	0.0
Cycle Q Clear(g_c), s	0.3	0.0	0.1	1.2	0.0	0.3	0.0	0.0	9.2	0.4	7.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.00		0.04	1.00		0.00
Lane Grp Cap(c), veh/h	29	0	26	80	0	99	0	0	1190	31	1360	0
V/C Ratio(X)	0.31	0.00	0.15	0.47	0.00	0.08	0.00	0.00	0.48	0.45	0.45	0.00
Avail Cap(c_a), veh/h	555	0	495	555	0	523	0	0	1190	617	1360	0
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	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	28.0	0.0	27.9	26.8	0.0	25.4	0.0	0.0	5.3	28.0	3.1	0.0
Incr Delay (d2), s/veh	6.0	0.0	2.7	4.3	0.0	0.3	0.0	0.0	1.4	10.0	1.1	0.0
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	0.2	0.0	0.1	0.7	0.0	0.1	0.0	0.0	5.1	0.3	4.2	0.0
LnGrp Delay(d),s/veh	33.9	0.0	30.7	31.1	0.0	25.7	0.0	0.0	6.7	38.0	4.2	0.0
LnGrp LOS	C		C	C		C			A	D	A	
Approach Vol, veh/h		13			46			571			630	
Approach Delay, s/veh		32.9			30.2			6.7			5.0	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	5.0	41.0		4.9		46.0		6.6
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s	20.0	18.0		18.0		42.0		18.0
Max Q Clear Time (g_c+I1), s	2.4	11.2		2.3		9.7		3.2
Green Ext Time (p_c), s	0.0	2.0		0.0		4.4		0.1

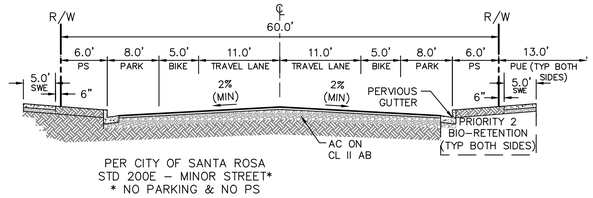
Intersection Summary	
HCM 2010 Ctrl Delay	7.0
HCM 2010 LOS	A

Appendix D – Northpoint Parkway Interchange Exhibit



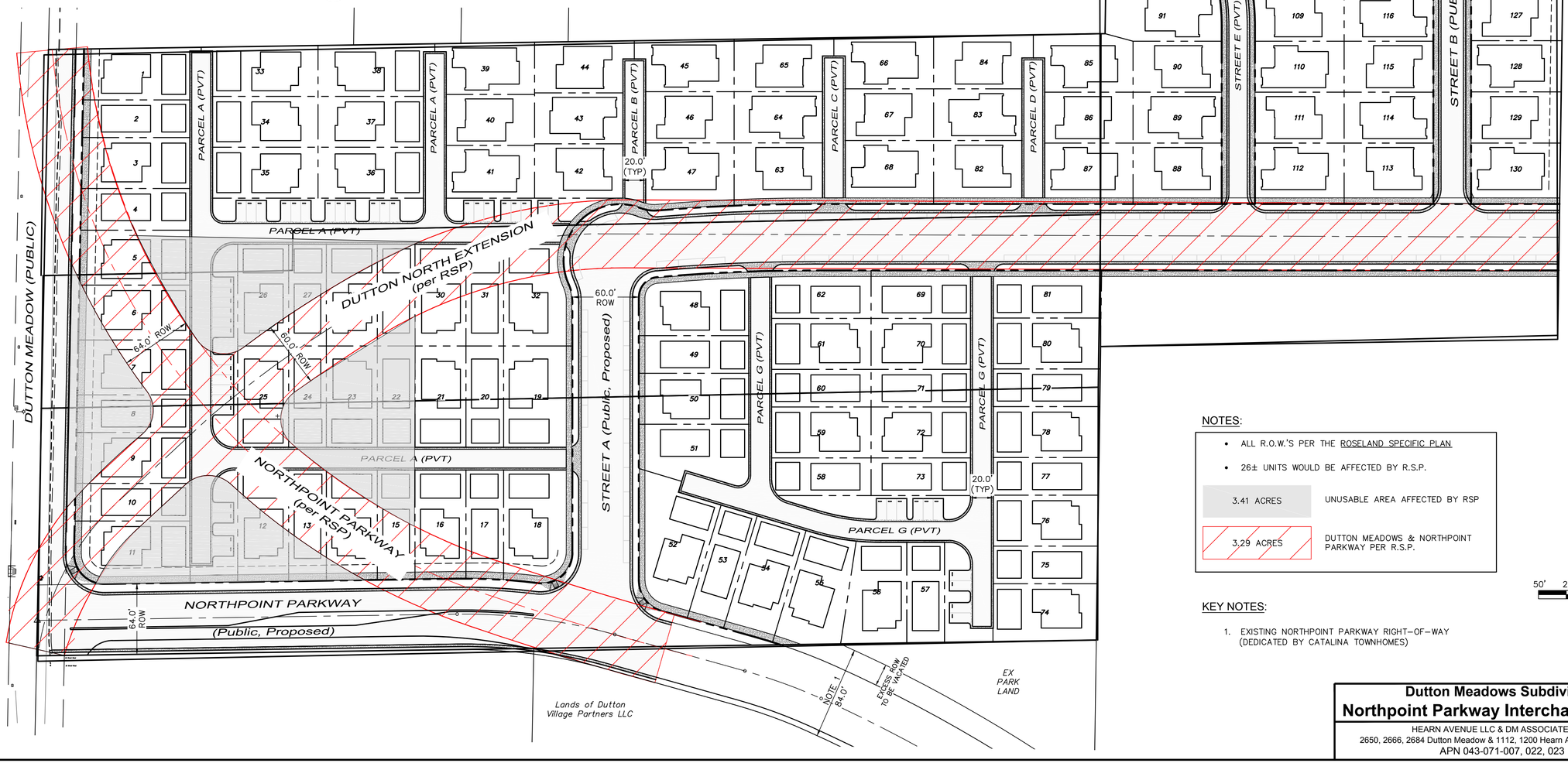
NORTHPOINT PARKWAY SECTION (PUBLIC)

NTS



STREET A SECTION (PUBLIC)

NTS



NOTES:

- ALL R.O.W.'S PER THE ROSELAND SPECIFIC PLAN
- 26± UNITS WOULD BE AFFECTED BY R.S.P.

3.41 ACRES	UNUSABLE AREA AFFECTED BY RSP
3.29 ACRES	DUTTON MEADOWS & NORTHPOINT PARKWAY PER R.S.P.

KEY NOTES:

1. EXISTING NORTHPOINT PARKWAY RIGHT-OF-WAY (DEDICATED BY CATALINA TOWNHOMES)

N

50' 25' 0 25' 50' 100' 150'

Graphic Scale: 1" = 50'

February 27, 2019

Dutton Meadows Subdivision

Northpoint Parkway Interchange Exhibit

HEARN AVENUE LLC & DM ASSOCIATES LLC
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APN 043-071-007, 022, 023

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"A Service You Can Count On!"

Appendix E – City of Santa Rosa Dutton Meadows Phase 2 Memorandum

City of Santa Rosa
TRANSPORTATION & PUBLIC WORKS

M E M O R A N D U M

DATE: FEBRUARY 1, 2019

TO: AMY NICHOLSON – CITY PLANNER

FROM: ROBERT SPRINKLE – CITY TRAFFIC ENGINEER

SUBJECT: DUTTON MEADOWS PHASE 2

In reviewing the proposed street layout for Dutton Meadow Phase 2, the layout is inconsistent with the plan lines identified in the General Plan. The General Plan identifies Northpoint Parkway as a regional arterial roadway that connects South Wright Road (the westerly boundary of the City) to Dutton Avenue. This roadway is expected to accommodate a higher level of traffic to move people and goods, and has been planned to distribute the community traffic burden.

The Roseland Specific Plan updated the General Plan to support key landuse and circulation desgin features. The alignment proposed in the Specific Plan supports and identifies some of these features:

- Enhance connectivity and promote multimodal transportation
- Improve traffic flow
- Enhance safety for all users along the roadway and at intersections
- Ease traffic congestion along Hearn Avenue

Below, Figure 1 shows the Roseland Specific Plan approved alignment, while Figure 2 shows the Developer's Proposed alignment.

Figure 1-Roseland Specific Plan

Figure 2 – Developer's Proposal

As proposed with the Dutton Meadow Phase 2 project, the street layout transforms the intended primary through movements at a new intersection of Northpoint Parkway and Dutton Meadow to 90-degree turning movements. When reviewing the volumes at this intersection, the majority of traffic would travel from southbound to eastbound, turning left and from westbound to northbound turning right. This layout is often less efficient than having the majority of the traffic flow being maintained straight through an intersection.

Additionally, this layout produces more potential conflicts with turning vehicles and pedestrian movements that typically operate at the same time. For example, a typical signal allows the adjacent pedestrian signal run during the same time a through movement is on. This works well when the through movement is heavy and the pedestrians walk adjacent to that traffic. When the majority of traffic turns right at an intersection, that pedestrian movement would need its own time to operate without any conflicting vehicles moving. Although this may seem minor, there is a school that would utilize this signal to allow pedestrians to walk to this school from the proposed development. This would generate a large pedestrian demand during the AM peak period impacting the overall signal operations.

There are other examples of 90-degree intersections that would operate better today if they were not offset. The intersections of Range Avenue/Bicentennial Way and Range Avenue/Piner Road is a prime example where the main flow of traffic flow navigates two 90-degree turns in order to continue in an east or westbound direction. If Bicentennial Way had been aligned with Piner Road directly, the intersection would operate much more efficiently than it does today.

For the residential community south of the proposed Northpoint Parkway that want to use Dutton Meadow to head in the general direction of the Hearn Interchange, the developer's proposed layout encourages vehicles to continue traveling north on Dutton Meadow and then turn east on Hearn Avenue. The traffic study appears to model this behavior and identifies the intersections do operate at an acceptable level. However, this would increase traffic congestion on the section of Hearn Avenue between intersections #1 and #2 in Figure 2 above. This would also contradict the fourth bullet above that states to ease traffic congestion on Hearn Avenue. Hearn Avenue is intended to remain a 3-lane facility with one travel lane in each direction and a center turn lane. There is not right of way available to widen Hearn Avenue without affecting existing homes. The traffic study states that any increase in volume on Hearn may cause it to become oversaturated and that people may use the "New Street" as an alternate if they experience delays on Hearn Avenue. In contrast, the Roseland Specific Plan alignment encourages vehicles to stay on the new portion of street that would connect from Northpoint Parkway to Dutton Avenue to the east and bypass the segment of Hearn Avenue between intersections #1 and #2 in Figure 1.

Additionally, the traffic study doesn't distribute the trips differently to show any potential benefit with the planned alignment compared to the proposed. For example, the Future PM + Project Planned scenario shows the identical volumes at the intersection of Dutton Avenue and Hearn Avenue to the Future PM + Project Proposed scenario. Further, the traffic study states that any increase in volume on Hearn Avenue may cause it to become oversaturated and that people may use the "Street A" as an alternate if they experience delays on Hearn Avenue.

While "Street A" provides an additional connection to Hearn Avenue east of Dutton Meadow, it is configured in a way that requires four 90-degree turns through a residential neighborhood, creating a less desirable and obvious route to travel to Hearn Avenue. As promoted in the Roseland Specific Plan, the function of A Street is designated as a collector/transitional street. It would be designed to encourage traffic south of Northpoint Parkway from Dutton Meadow, that desires to head to the Hearn Interchange, to travel in a through movement onto the new A Street and eventually terminating at Dutton Avenue. This General Plan alignment maintains separation between these more local trips from the regional cross-town trips that would be using Northpoint Parkway. As proposed, Street A will function like a neighborhood street.

As a result of less vehicles using Street A with the proposed alignment, these trips would be reassigned to the northern segment of Dutton Meadow. Dutton Meadow between Hearn Avenue and Northpoint Parkway would then be required to handle not only the planned regional traffic, but the traffic from the southern portion of Dutton Meadow. During the Roseland Specific Plan, this segment of road was reduced from a 4-lane facility to a 2-lane facility due to the planned alignment and circulation study. This would need to be re-evaluated to determine if the capacity of this segment of roadway could continue to operate effectively with 2 lanes. Currently, there have already been reports of congestion relating to school ingress during arrival and dismissal. Combining school, regional traffic and traffic from the southern portion of Dutton Meadow could require additional capacity that was previously not considered.