

# Appendix K

## Diversion Analysis

## Project Description

The Project includes the potential closure of the eastbound direction ramp for vehicular traffic at Washington Street and University Avenue. In addition, the concept proposes to restrict vehicular traffic on the westbound direction at University Avenue and Front Street. The purpose of these changes to vehicular circulation (diversion) is to achieve the traffic volumes necessary to create a low stress street to accommodate a Bicycle Boulevard bikeway design along the section of University Avenue between Ibis Street and Front Street.

This preliminary capacity analysis has been prepared to evaluate the potential effect in vehicular capacity along Washington Street as a result of traffic diversion from this section of University Avenue. This analysis used available turn movement data from multiple sources and newly commissioned intersection counts.

The study area is shown in Figure 1. The locations analyzed are listed below.

## Intersections

- |  |                                    |
|--|------------------------------------|
| 1. Washington Ave and Goldfinch St                   | 13. University Ave and Fourth Ave  |
| 2. Washington Ave and Front St                       | 14. University Ave and Fifth Ave   |
| 3. Washington Ave and First Ave                      | 15. University Ave and Sixth Ave   |
| 4. Washington Ave and Fourth Ave                     | 16. University Ave and Seventh Ave |
| 5. Washington Ave and Fifth Ave                      | 17. University Ave and Eighth Ave  |
| 6. Washington Ave and Eight Ave/SR 163<br>Off-Ramp   | 18. University Ave and Ninth Ave   |
| 7. Washington Ave and Richmond St/ SR 163<br>On-Ramp | 19. University Ave and Tenth Ave   |
| 8. Washington Ave and Lincoln Ave                    | 20. University Ave and Vermont St  |
| 9. University Ave and Hawk St                        | 21. University Ave and Richmond St |
| 10. University Ave and Goldfinch St                  | 22. University Ave and Normal St   |
| 11. University Ave and Front Ave                     | 23. University Ave and Park Blvd   |
| 12. University Ave and First Ave                     | 24. Normal St and Park Blvd        |
|  | 25. Robinson Ave and Park Blvd     |

## Study Scenarios

The following scenarios were analyzed:

- Year 2035 without Project
- Year 2035 with Project

The purpose of this preliminary capacity analysis is to identify any potential issues that may be associated with the Project once implemented. A complete traffic impact study including existing and future conditions will be conducted during the preliminary engineering phase of the Project.

### Year 2035 Traffic Volumes

The implemented traffic growth to the roadway network within the study area is a function of expected land development, economic activity, and changes in demographics. Several methods can be used to estimate this growth. For the purposes of this analysis, Year 2008 and Year 2035 based on the San Diego Association of Governments computerized travel forecast model (Series 12 Select Zone Analysis) were used. Using the existing counts volumes and the growth factor calculated by the interpolation of the two models, future base volumes were developed. Appendix K-A contains the growth calculation worksheets.

### Intersection Analysis Results

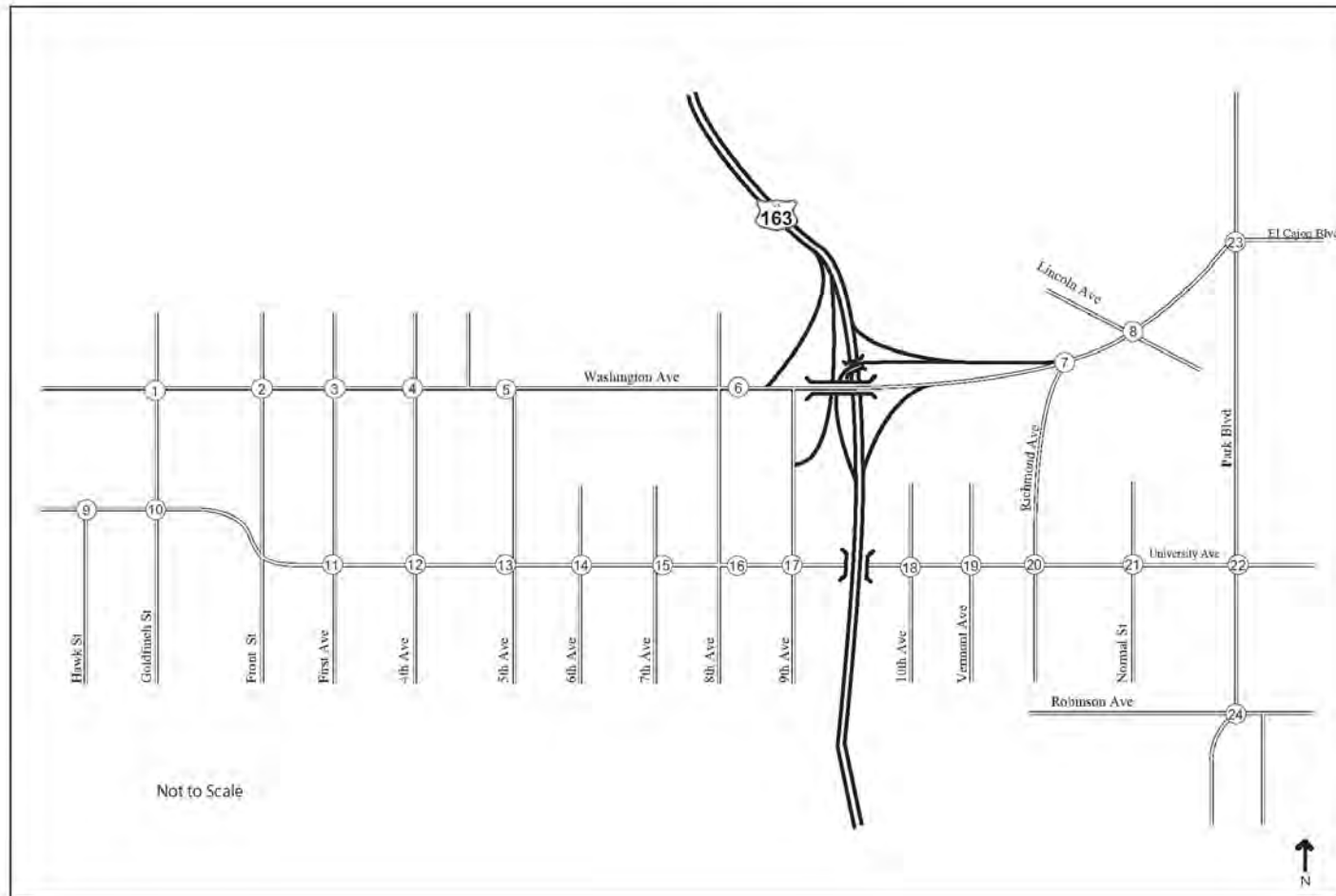
Year 2035 peak hour period turning movement traffic volumes for both AM and PM peak hour were analyzed. Figures 2 and 3 show Year 2035 AM and PM peak hour without project traffic conditions for intersections respectively. Appendix K-B contains the traffic analysis methodologies and concepts used in this analysis.

The 2035 baseline analysis assumes no roadway network changes. Table I summarizes the results of the intersection analysis. As shown on Table I, all intersections in the study area operate at a level of service (LOS) D or above except for the following intersections:

- University Ave and 6th Ave – LOS E (AM peak hour)
- Washington St and 8<sup>th</sup> Ave/SR 163 Off-Ramp – LOS F (PM peak hour)
- University Ave and Front St – LOS F (PM peak hour)
- University Ave and Sixth Ave – LOS E (PM peak hour)

Appendix K-C contains the intersection analysis worksheets for the 2035 peak hour without project.

Figure I – Study Area



Not to Scale

LEGEND	
	Geometric Configuration
	Traffic Signal

⑨ Study Intersection Location

- Park
- Trolley Stop
- Rail Road
- School
- Library

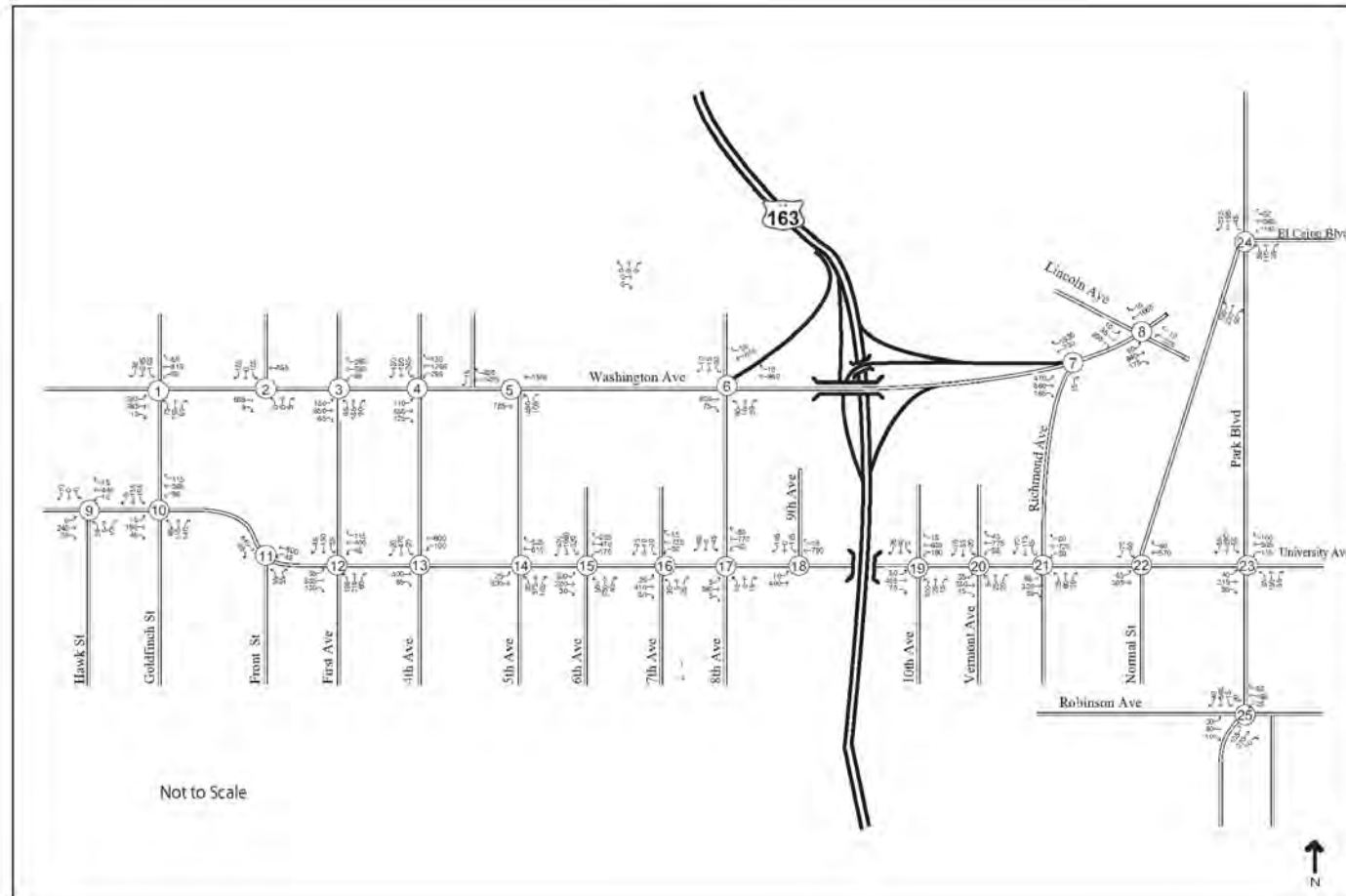
**Uptown Regional Bike Corridor Project**

Study Area





Figure 2 – Year 2035 AM Peak without Project Traffic Conditions



LEGEND	
	Geometric Configuration
	Traffic Signal

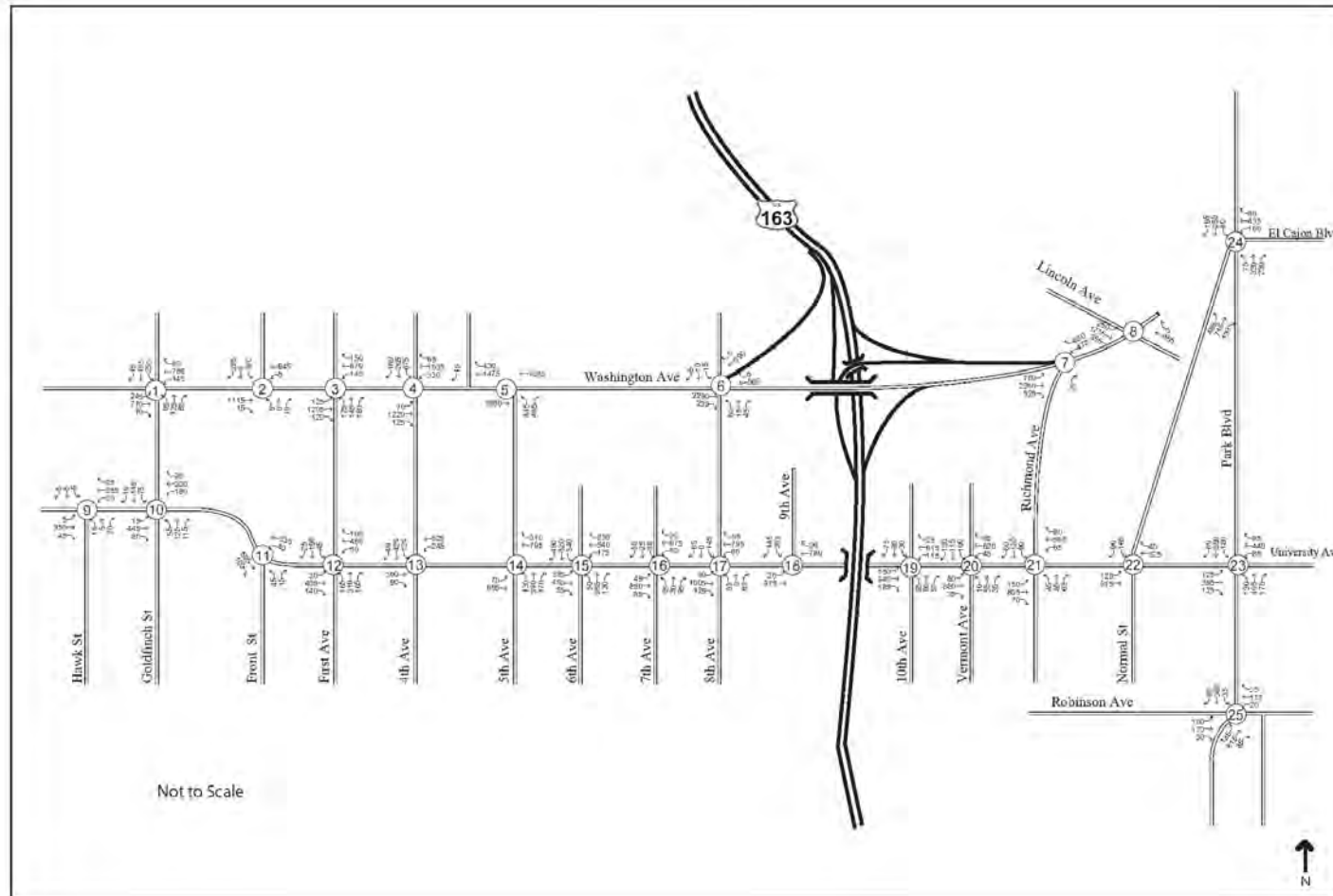
Study Intersection Location

- Park
- Rail Road
- Trolley Stop
- School
- Library

**Uptown Regional Bike Corridor Project**  
Year 2035 AM Peak Hour without Project



Figure 3 – Year 2035 PM Peak without Project Traffic Conditions



LEGEND	
	Geometric Configuration
	Traffic Signal

Study Intersection Location

Park

Rail Road

Trolley Stop

School

Library

**Uptown Regional Bike Corridor Project**  
Year 2035 PM Peak Hour without Project



**Table I – Year 2035 Peak Hour without Project**

Year 2035 without Project Conditions	AM Peak Hour		PM Peak Hour	
	Delay	LOS	Delay	LOS
1. Washington Ave & Goldfinch St	35.8	D	35.9	D
2. Washington Ave & Front St	11.5	B	15.9	B
3. Washington Ave & First Ave	26.3	C	33.8	C
4. Washington Ave & Fourth Ave	25.0	C	37.0	D
5. Washington Ave & Fifth Ave	13.7	B	20.1	C
6. Washington Ave & Eight Ave/SR-163 Off Ramp	42.1	D	317.2	F
7. Washington Ave & Richmond St/SR-163 On Ramp	19.8	B	15.2	B
8. Washington Ave & Lincoln Ave	51.3	D	48.2	D
9. University Ave & Hawk St	18.6	C	22.9	C
10. University Ave & Goldfinch St	10.9	B	18.0	B
11. University Ave & Front Ave	27.9	D	53.1	F
12. University Ave & First Ave	19.8	C	28.2	C
13. University Ave & Fourth Ave	21.3	C	24.3	C
14. University Ave & Fifth Ave	20.9	C	28.3	C
15. University Ave & Sixth Ave	56.4	E	69.1	E
16. University Ave & Seventh Ave	4.1	A	8.6	A
17. University Ave & Eighth Ave	12.2	C	24.7	C
18. University Ave & Ninth Ave	8.0	B	11.9	B
19. University Ave & Tenth Ave	19.3	C	20.2	C
20. University Ave & Vermont St	12.0	B	17.8	B
21. University Ave & Richmond St	19.5	C	23.3	C
22. University Ave & Normal St	7.2	A	9.7	A
23. University Ave & Park Blvd	23.5	D	41.6	D
24. Normal St & Park Blvd	23.2	C	32.0	C
25. Robinson Ave & Park Blvd	7.1	A	8.6	A

### Year 2035 with Project Conditions

Year 2035 with project traffic volumes were developed by reassigning the Year 2035 base volumes discussed previously for both eastbound and westbound traffic from University Avenue onto Washington Street and adjacent streets. Changes were assessed by comparing the Year 2035 without Project conditions against the Year 2035 with the addition of the project traffic. Below is the list of assumptions made for the Diversion Analysis under Year 2035 with Project conditions (diversion from University Avenue to Washington Street).

- A 5 percent reduction was applied to diverted trips due to mode conversion from vehicle to bicycle as a result of the Project
- 50 bicycles on both eastbound and westbound direction on University Avenue

During the AM Peak hour

- 225 trips were diverted in the eastbound direction
- 390 trips were diverted in the westbound direction

During the PM Peak hour

- 500 trips were diverted in the eastbound direction
- 550 trips were diverted in the westbound direction

A summary of the results is presented below.

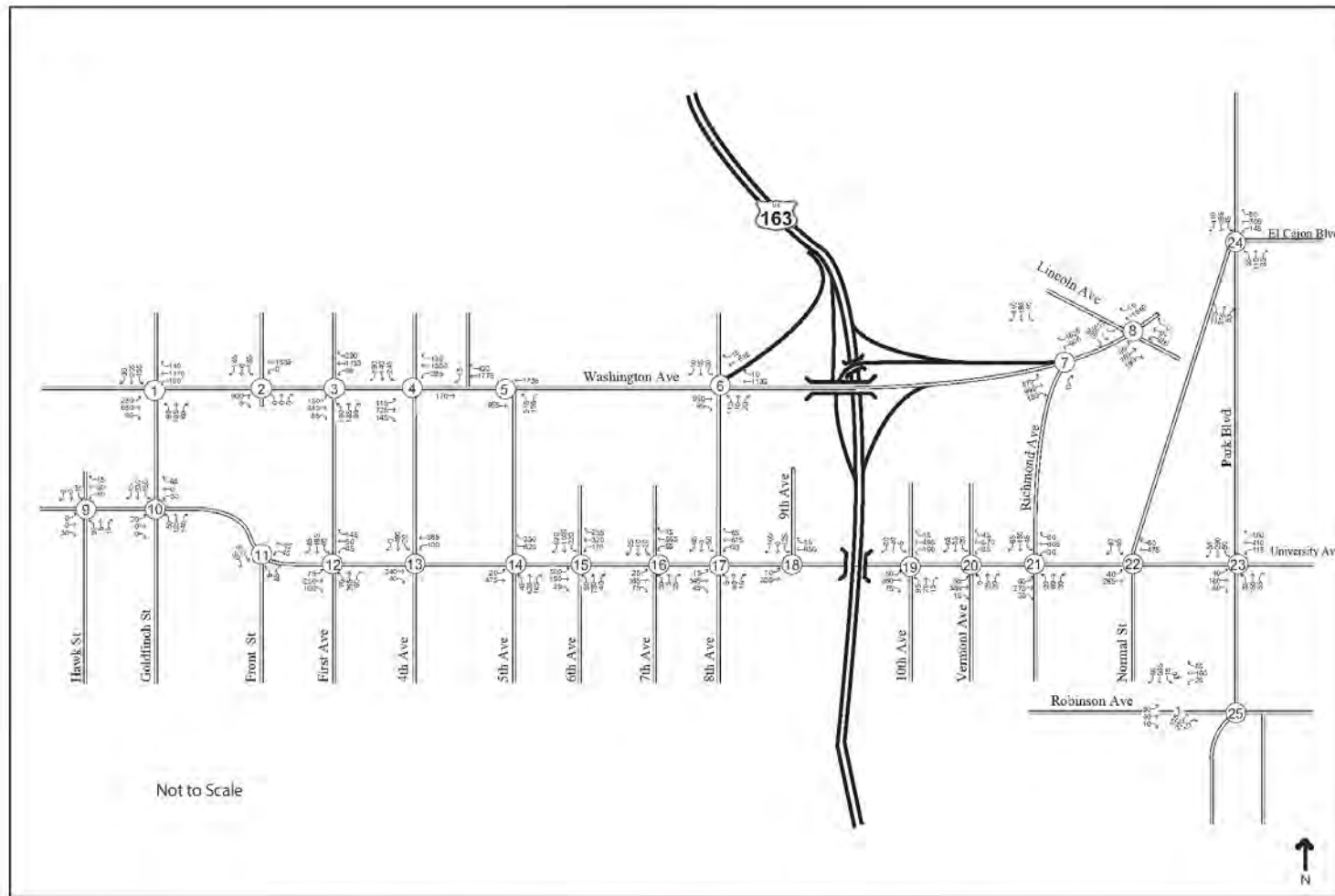
### Intersection Analysis Results

The Year 2035 with project peak hour period turning movement traffic volumes for both AM and PM peak hour are summarized in Figures 4 and 5 respectively. Table 2 summarizes the results of the intersection analysis. All intersections in the study area are calculated to operate at LOS D or above except for the following:

- University Ave and 6th Ave (LOS E) during both AM peak and PM peak hour
- Washington St and 8<sup>th</sup> Ave/SR 163 Off-Ramp (LOS E) during the AM peak hour and (LOS F) PM peak hour
- Washington St and Lincoln Ave (LOS E) during the AM peak hour and (LOS E) during the PM peak hour
- Normal St and Park Blvd (LOS F) during the PM peak hour

Appendix K-D includes Year 2035 with project peak hour intersection analysis worksheets.

Figure 3 – Year 2035 AM Peak with Project Traffic Conditions



Not to Scale

LEGEND	
	Geometric Configuration
	Traffic-Signet

Study Intersection Location

Park

Rail Road

Trolley Stop

School

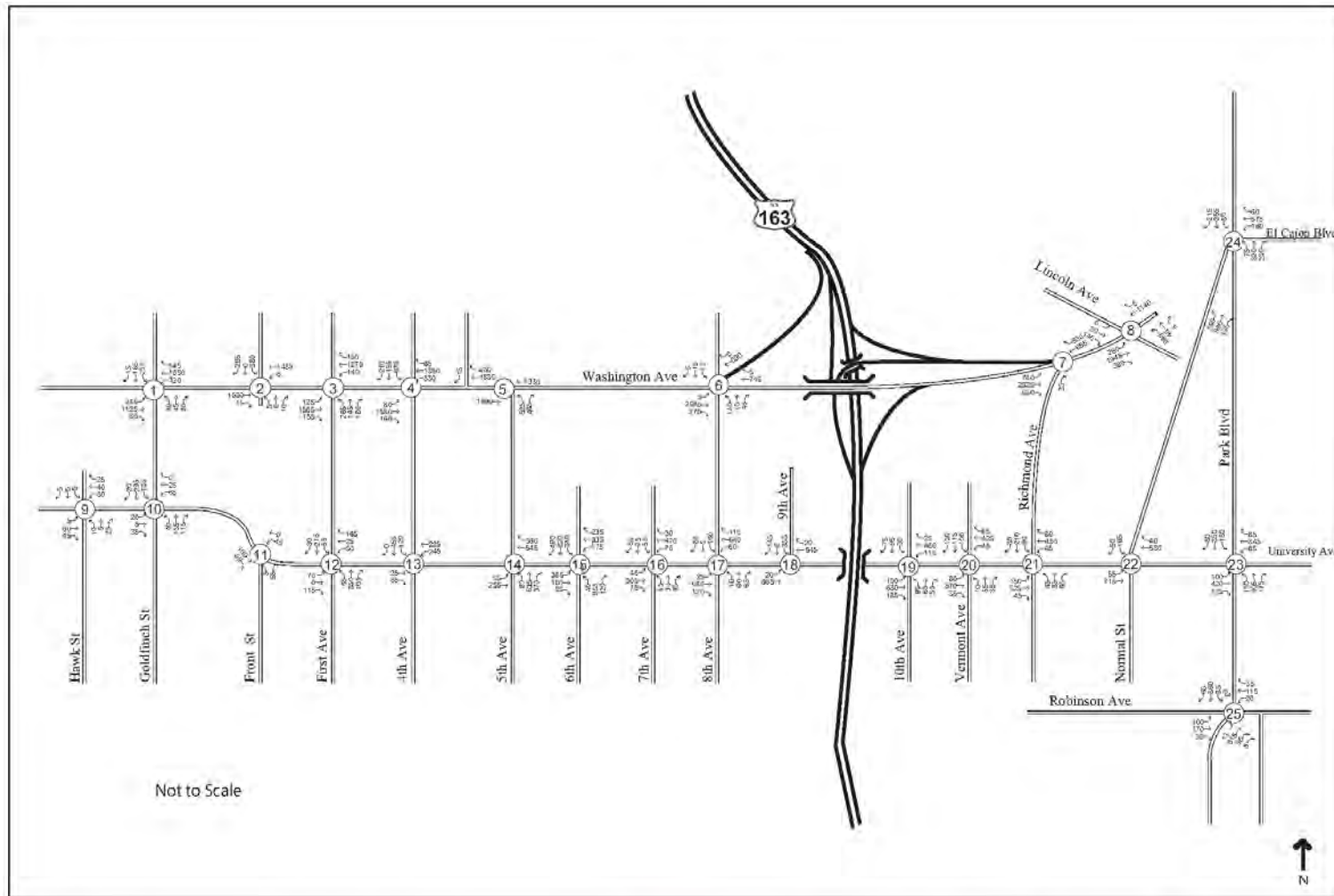
Library

**Uptown Regional Bike Corridor Project**

Year 2035 AM Peak Hour with Project



Figure 3 – Year 2035 PM Peak with Project Traffic Conditions



Not to Scale

LEGEND	
	Geometric Configuration
	Traffic Signal

⑨ Study Intersection Location

Park  
 Rail Road

Trolley Stop  
 School  
 Library

**Uptown Regional Bike Corridor Project**

Year 2035 PM Peak Hour with Project

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**Table 2 – Year 2035 Peak Hour with Project**

Intersections	Year 2035 without Project		Year 2035 with Project		Δ Delay	Significant
	Delay	LOS	Delay	LOS		
<b>AM Peak Hour</b>						
1. Washington Ave & Goldfinch St	35.8	D	30.8	C	-5.0	No
2. Washington Ave & Front St	11.5	B	8.1	A	-3.4	No
3. Washington Ave & First Ave	26.3	C	24.1	C	-2.2	No
4. Washington Ave & Fourth Ave	25.0	C	23.7	C	-1.3	No
5. Washington Ave & Fifth Ave	13.7	B	24.8	C	11.1	No
6. Washington Ave & Eight Ave/SR-163 Off Ramp	42.1	D	66.1	E	24.0	Yes
7. Washington Ave & Richmond St/SR-163 On Ramp	19.8	B	16.8	B	-3.0	No
8. Washington Ave & Lincoln	51.3	D	78.6	E	27.3	Yes
9. University Ave & Hawk St	18.6	C	9.3	A	-9.3	No
10. University Ave & Goldfinch St	10.9	B	9.3	A	-1.6	No
11. University Ave & Front Ave	27.9	D	11.0	B	-16.9	No
12. University Ave & First Ave	19.8	C	15.8	B	-4.0	No
13. University Ave & Fourth Ave	21.3	C	25.3	C	4.0	No
14. University Ave & Fifth Ave *	20.9	C	23.4	C	2.5	No
15. University Ave & Sixth Ave *	56.4	E	68.2	E	11.8	Yes
16. University Ave & Seventh Ave	4.1	A	4.8	A	0.7	No
17. University Ave & Eighth Ave	12.2	C	12.2	B	0.0	No
18. University Ave & Ninth Ave	8.0	B	10.1	B	2.1	No
19. University Ave & Tenth Ave	19.3	C	16.9	B	-2.4	No
20. University Ave & Vermont St	12.0	B	13.8	B	1.8	No
21. University Ave & Richmond St	19.5	C	16.5	B	-3.0	No
22. University Ave & Normal St	7.2	A	8.9	A	1.7	No
23. University Ave & Park Blvd	23.5	D	23.9	C	0.4	No
24. Normal St & Park Blvd	23.2	C	24.6	C	1.4	No
25. Robinson Ave & Park Blvd	7.1	A	7.1	A	0.0	No
<b>PM Peak Hour</b>						
1. Washington Ave & Goldfinch St	35.9	D	35.8	D	-0.1	No
2. Washington Ave & Front St	15.9	B	13.2	B	-2.7	No
3. Washington Ave & First Ave	33.8	C	51.8	D	18.0	No
4. Washington Ave & Fourth Ave	37.0	D	44.3	D	7.3	No
5. Washington Ave & Fifth Ave	20.1	C	26.0	C	5.9	No
6. Washington Ave & Eight Ave/SR-163 Off Ramp	317.2	F	342.8	F	25.6	Yes
7. Washington Ave & Richmond St/SR-163 On Ramp	15.2	B	4.9	A	-10.3	No
8. Washington Ave & Lincoln Ave	48.2	D	68.3	E	20.1	Yes
9. University Ave & Hawk St	22.9	C	9.9	A	-13.0	No
10. University Ave & Goldfinch St	18.0	B	9.5	A	-8.5	No
11. University Ave & Front Ave	53.1	F	9.9	A	-43.2	No
12. University Ave & First Ave	28.2	C	17.6	B	-10.6	No
13. University Ave & Fourth Ave	24.3	C	27.7	C	3.4	No
14. University Ave & Fifth Ave	28.3	C	32.6	C	4.3	No
15. University Ave & Sixth Ave	69.1	E	70.3	E	1.2	No
16. University Ave & Seventh Ave	8.6	A	12.3	B	3.7	No
17. University Ave & Eighth Ave	24.7	C	23.3	C	-1.4	No
18. University Ave & Ninth Ave	11.9	B	16.9	B	5.0	No
19. University Ave & Tenth Ave	20.2	C	21.8	C	1.6	No
20. University Ave & Vermont St	17.8	B	18.0	B	0.2	No
21. University Ave & Richmond St	23.3	C	20.1	C	-3.2	No
22. University Ave & Normal St	9.7	A	7.7	A	-2.0	No
23. University Ave & Park Blvd	41.6	D	36.2	D	-5.4	No
24. Normal St & Park Blvd	32.0	C	86.9	F	54.9	Yes
25. Robinson Ave & Park Blvd	8.6	A	8.6	A	0.0	No



## Appendix K-A: Growth Calculation Sheet

Table I – Growth Calculation Sheet

Roadway Segment	Year 2008	Year 2035	Growth	Adj. Growth
<b>University Avenue</b>				
west of Goldfinch	9600	11400	1.2	
east of Goldfinch	14900	17100	1.1	
1st - 3rd	12000	15000	1.3	
3rd - 4th	13100	16200	1.2	
4th - 5th	18700	24000	1.3	
5th - 6th	23400	31400	1.3	
<b>Subtotal</b>	<b>91700</b>	<b>115100</b>	<b>1.26</b>	<b>1.26</b>
6th - 7th	28000	29400	1.1	
7th - 8th	28000	29400	1.1	
8th - 9th	25400	28700	1.1	
9th - 10th	25800	29000	1.1	
<b>Subtotal</b>	<b>107200</b>	<b>116500</b>	<b>1.09</b>	<b>1.09</b>
10th - Vermont	30700	33100	1.1	
Vermont - Richmond	25600	24700	1.0	
Richmond - Normal	21600	17000	0.8	
Normal - Centre	19900	14900	0.7	
Centre - Park	21600	16200	0.8	
<b>Subtotal</b>	<b>119400</b>	<b>105900</b>	<b>0.89</b>	<b>1.05</b>
<b>Park Boulevard</b>				
University - Essex	16000	18400	1.2	
Essex - Robinson	14700	16700	1.1	
Robinson - Pennsylvania	17000	18800	1.1	
Brookes - Myrtle	12800	15000	1.2	
Upas - Morley Field	13200	16200	1.2	
Morley Field - Zoo	15100	18100	1.2	
<b>Subtotal</b>	<b>88800</b>	<b>103200</b>	<b>1.16</b>	<b>1.16</b>
<b>Washington Street</b>				
University - Hawk	22500	25700	1.1	
Hawk-Goldfinch	26900	30600	1.1	
Goldfinch-Dove	25700	29300	1.1	
Dove-Albatross	26200	29800	1.1	
Albatross-Front	26000	28700	1.1	
Front-1st	26500	29200	1.1	
1st - 3rd	31300	31600	1.0	
3rd - 4th	32300	32800	1.0	
4th - 5th	37700	37800	1.0	
5th - 6th	33500	42500	1.3	
6th - 7th	39400	42500	1.1	
7th - 8th	39400	42500	1.1	
8th - 9th	40900	43800	1.1	



Roadway Segment	Year 2008	Year 2035	Growth	Adj. Growth
<b>University Avenue</b>				
9th-Vermont	34200	37900	1.1	
Vermont - Richmond	41500	44400	1.1	
<b>Subtotal</b>	<b>484000</b>	<b>529100</b>	<b>1.09</b>	<b>1.09</b>
<b>Goldfinch St</b>				
North of Washington	12200	12900	1.1	
Washington-University	5600	6800	1.2	
South of University	8700	9500	1.1	
<b>Subtotal</b>	<b>26500</b>	<b>29200</b>	<b>1.10</b>	<b>1.10</b>
<b>Albatross</b>				
North of Washington	4300	5700	1.3	
Washington-University	2800	3800	1.4	
<b>Subtotal</b>	<b>7100</b>	<b>9500</b>	<b>1.34</b>	<b>1.34</b>
<b>Front</b>				
North of Washington	6200	7700	1.2	
South of Washington	2900	3700	1.3	
<b>Subtotal</b>	<b>9100</b>	<b>11400</b>	<b>1.25</b>	<b>1.25</b>
Roadway Segment	Year 2008	Year 2035	Growth	Adj. Growth
<b>1st</b>				
North of Washington	5400	7700	1.4	
Washington-University	6000	7400	1.2	
South of University	10400	13500	1.3	
<b>Subtotal</b>	<b>21800</b>	<b>28600</b>	<b>1.31</b>	<b>1.31</b>
<b>4th</b>				
North of Washington	12400	12400	1.0	
Washington-University	10400	12100	1.2	
South of University	12000	13100	1.1	
<b>Subtotal</b>	<b>34800</b>	<b>37600</b>	<b>1.08</b>	<b>1.08</b>
<b>5th</b>				
Washington-University	11600	12600	1.1	
South of University	10100	13700	1.4	
<b>Subtotal</b>	<b>21700</b>	<b>26300</b>	<b>1.21</b>	<b>1.21</b>
<b>6th</b>				
North of Washington	36000	43400	1.2	
Washington-University	36000	43400	1.2	
South of University	27600	31200	1.1	
<b>Subtotal</b>	<b>99600</b>	<b>118000</b>	<b>1.18</b>	<b>1.18</b>
<b>9th</b>				
Washington-University	10500	11400	1.1	
<b>Subtotal</b>	<b>10500</b>	<b>11400</b>	<b>1.09</b>	<b>1.09</b>
<b>SR 163 Ramp/8th</b>				
Off-Ramp	13000	14900	1.1	
<b>Subtotal</b>	<b>13000</b>	<b>14900</b>	<b>1.15</b>	<b>1.15</b>
<b>Vermont</b>				

Roadway Segment	Year 2008	Year 2035	Growth	Adj. Growth
<b>University Avenue</b>				
North of University	6600	8200	1.2	
<b>Subtotal</b>	<b>6600</b>	<b>8200</b>	<b>1.24</b>	<b>1.24</b>
<b>Richmond</b>				
South of Washington	11500	10100	0.9	
North of University	11600	6900	0.6	
South of University	8100	9500	1.2	
<b>Subtotal</b>	<b>31200</b>	<b>26500</b>	<b>0.85</b>	<b>0.85</b>
<b>Lincoln</b>				
North of Washington	4100	4300	1.0	
South of Washington	8400	11100	1.3	
<b>Subtotal</b>	<b>12500</b>	<b>15400</b>	<b>1.23</b>	<b>1.23</b>
<b>Normal</b>				
North of University	3800	3900	1.0	
South of Park	23600	28100	1.2	
<b>Subtotal</b>	<b>27400</b>	<b>32000</b>	<b>1.17</b>	<b>1.17</b>
<b>El Cajon</b>				
East of Park	21300	23600	1.1	
<b>Subtotal</b>	<b>21300</b>	<b>23600</b>	<b>1.11</b>	<b>1.11</b>
<b>Robinson</b>				
West of Park	9300	10900	1.2	
East of Park	4600	4900	1.1	
<b>Subtotal</b>	<b>13900</b>	<b>15800</b>	<b>1.14</b>	<b>1.14</b>

## Appendix K-B: Traffic Analysis Methodology

A brief overview of traffic analysis methodologies and concepts used in this analysis is presented in this section. Street system operating conditions are typically described in terms of “level of service.” LOS is a report-card scale used to indicate the traffic flow on roadway segments and at intersections. LOS ranges from LOS A (free flow, little congestion) to LOS F (forced flow, extreme congestion).

### Intersection Capacity

The analysis of peak hour intersection performance was conducted using the Synchro analysis software program, which uses methodologies defined in the 2000 Highway Capacity Manual (HCM) to calculate results. LOS for intersections is determined by control delay. Control delay is defined as the total elapsed time from when a vehicle stops at the end of a queue to the time the vehicle departs from the stop line. The total elapsed time includes the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position; including deceleration of vehicles from free-flow speed to the speed of vehicles in the queue. The HCM LOS for the range of delay by seconds for unsignalized and signalized intersections is described in Table I.

**Table I  
Unsignalized and Signalized Intersection Level of Service (HCM 2000)**

Level of Service	Unsignalized	Signalized
	Average Control Delay (seconds/vehicle)	Average Control Delay (seconds/vehicle)
A	0-10	0-10
B	> 10-15	> 10-20
C	> 15-25	> 20-35
D	> 25-35	> 35-55
E	> 35-50	> 55-80
F	>50	> 80

Source: Highway Capacity Manual 2000.

### Signalized Intersections

The HCM analysis methodology for evaluating signalized intersections is based on the “operational analysis” procedure. This technique uses 1,900 passenger cars per hour of green per lane as the maximum saturation flow of a single lane at an intersection. This saturation flow rate is adjusted to account for lane width, on-street parking, conflicting pedestrian flow, traffic composition, (e.g., the percentage of vehicles that are trucks), and shared lane movements (e.g., through and right-turn movements from the same lane). Average control delay is calculated by taking a volume-weighted average of all the delays for all vehicles entering the intersection.

### Level of Service Definitions

The concept of LOS is defined as a qualitative measure describing operational conditions within a traffic stream, and the motorists' and/or passengers' perception of operations. A LOS definition generally describes these conditions in terms of such factors as speed, travel time, freedom to maneuver, comfort, convenience, and safety. Levels of service for freeway segments can generally be categorized as shown in the table above.

## Appendix K-C: Peak Hour Intersection Analysis Worksheets – 2035 Conditions

HCM Signalized Intersection Capacity Analysis

1: Washington St & First Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0				
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00				
Frpb, ped/bikes	1.00	0.98		1.00	0.98			0.99				
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00				
Frt	1.00	0.99		1.00	0.96			0.96				
Flt Protected	0.95	1.00		0.95	1.00			0.99				
Satd. Flow (prot)	1770	3423		1770	3322			1758				
Flt Permitted	0.12	1.00		0.28	1.00			0.99				
Satd. Flow (perm)	215	3423		521	3322			1758				
Volume (vph)	130	650	65	95	780	290	65	185	90	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	137	684	68	100	821	305	68	195	95	0	0	0
RTOR Reduction (vph)	0	7	0	0	34	0	0	11	0	0	0	0
Lane Group Flow (vph)	137	745	0	100	1092	0	0	347	0	0	0	0
Confl. Peds. (#/hr)			58			32			26			49
Confl. Bikes (#/hr)			19			7			4			6
Turn Type	pm+pt			pm+pt			Perm					
Protected Phases	5	2		1	6			4				
Permitted Phases	2			6			4					
Actuated Green, G (s)	57.8	49.3		55.2	48.0			36.5				
Effective Green, g (s)	59.1	50.2		56.5	48.9			37.4				
Actuated g/C Ratio	0.54	0.46		0.51	0.44			0.34				
Clearance Time (s)	4.4	4.9		4.4	4.9			4.9				
Vehicle Extension (s)	2.0	1.0		2.0	1.0			1.0				
Lane Grp Cap (vph)	241	1562		354	1477			598				
v/s Ratio Prot	0.05	0.22		0.02	0.33							
v/s Ratio Perm	0.26			0.13				0.20				
v/c Ratio	0.57	0.48		0.28	0.74			0.58				
Uniform Delay, d1	17.5	20.8		14.5	25.3			29.8				
Progression Factor	1.00	1.00		1.00	1.00			1.00				
Incremental Delay, d2	1.8	1.0		0.2	3.4			4.1				
Delay (s)	19.4	21.8		14.7	28.6			33.9				
Level of Service	B	C		B	C			C				
Approach Delay (s)		21.4			27.5			33.9			0.0	
Approach LOS		C			C			C			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			26.3	HCM Level of Service				C				
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			110.0	Sum of lost time (s)				12.0				
Intersection Capacity Utilization			74.9%	ICU Level of Service				D				
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
3: Washington St & Fifth Ave

10/17/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↖↗	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	0.97	0.91
Frbp, ped/bikes	1.00			1.00	1.00	0.95
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3539			3539	3433	1369
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3539			3539	3433	1369
Volume (vph)	785	0	0	1505	450	105
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	826	0	0	1584	474	111
RTOR Reduction (vph)	0	0	0	0	0	91
Lane Group Flow (vph)	826	0	0	1584	474	20
Confl. Peds. (#/hr)		52				31
Confl. Bikes (#/hr)		14				
Turn Type						Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	76.0			76.0	18.7	18.7
Effective Green, g (s)	76.9			76.9	19.1	19.1
Actuated g/C Ratio	0.74			0.74	0.18	0.18
Clearance Time (s)	4.9			4.9	4.4	4.4
Vehicle Extension (s)	1.0			1.0	1.0	1.0
Lane Grp Cap (vph)	2617			2617	630	251
v/s Ratio Prot	0.23			c0.45	c0.14	
v/s Ratio Perm						0.01
v/c Ratio	0.32			0.61	0.75	0.08
Uniform Delay, d1	4.6			6.4	40.2	35.2
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.3			1.0	4.5	0.1
Delay (s)	4.9			7.4	44.7	35.2
Level of Service	A			A	D	D
Approach Delay (s)	4.9			7.4	42.9	
Approach LOS	A			A	D	
<b>Intersection Summary</b>						
HCM Average Control Delay			13.7		HCM Level of Service	B
HCM Volume to Capacity ratio			0.63			
Actuated Cycle Length (s)			104.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			66.7%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis  
4: Washington St & Goldfinch St

10/17/2013

	↖		→		↘		↙		←		↖		↗		↑		↘		↙		↓		↖		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR													
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖		↖	↖														
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900													
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0														
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00														
Frbp, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00														
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00														
Frnt	1.00	1.00		1.00	0.99		1.00	0.96		1.00	0.98														
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00														
Satd. Flow (prot)	1770	3528		1770	3478		1770	1785		1770	1812														
Flt Permitted	0.95	1.00		0.95	1.00		0.35	1.00		0.39	1.00														
Satd. Flow (perm)	1770	3528		1770	3478		643	1785		728	1812														
Volume (vph)	280	465	10	50	815	60	75	155	60	155	205	30													
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95													
Adj. Flow (vph)	295	489	11	53	858	63	79	163	63	163	216	32													
RTOR Reduction (vph)	0	1	0	0	4	0	0	17	0	0	6	0													
Lane Group Flow (vph)	295	499	0	53	917	0	79	209	0	163	242	0													
Confl. Peds. (#/hr)							27																		
Confl. Bikes (#/hr)							3																		
Turn Type	Prot		Prot		Perm		Perm		Perm		Perm														
Protected Phases	5	2		1	6		8				4														
Permitted Phases							8				4														
Actuated Green, G (s)	22.0	62.4		7.3	47.3		21.4	21.4		20.5	20.5														
Effective Green, g (s)	22.4	63.3		7.3	48.2		21.4	21.4		21.4	21.4														
Actuated g/C Ratio	0.22	0.61		0.07	0.46		0.21	0.21		0.21	0.21														
Clearance Time (s)	4.4	4.9		4.0	4.9		4.0	4.0		4.9	4.9														
Vehicle Extension (s)	2.0	3.3		3.0	3.3		3.0	3.0		2.0	2.0														
Lane Grp Cap (vph)	381	2147		124	1612		132	367		150	373														
v/s Ratio Prot	0.17	0.14		0.03	0.26																				
v/s Ratio Perm							0.12			0.22															
v/c Ratio	0.77	0.23		0.43	0.57		0.60	0.57		1.09	0.65														
Uniform Delay, d1	38.4	9.3		46.3	20.3		37.4	37.2		41.3	37.8														
Progression Factor	1.00	1.00		0.93	1.13		1.00	1.00		1.00	1.00														
Incremental Delay, d2	8.7	0.3		2.2	1.4		7.1	2.1		98.5	2.9														
Delay (s)	47.1	9.5		45.4	24.4		44.5	39.3		139.8	40.7														
Level of Service	D	A		D	C		D	D		F	D														
Approach Delay (s)		23.5			25.6			40.7			80.0														
Approach LOS		C			C			D			F														
<b>Intersection Summary</b>																									
HCM Average Control Delay			35.8				HCM Level of Service				D														
HCM Volume to Capacity ratio			0.74																						
Actuated Cycle Length (s)			104.0				Sum of lost time (s)				12.0														
Intersection Capacity Utilization			75.2%				ICU Level of Service				D														
Analysis Period (min)			15																						
c Critical Lane Group																									



HCM Signalized Intersection Capacity Analysis  
5: Washington St & Front St

10/17/2013


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑			↑↓		↑	↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	4.0
Lane Util. Factor		0.95			0.95			1.00		0.95	0.95	1.00
Frbp, ped/bikes		1.00			1.00			1.00		1.00	1.00	0.94
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	1.00
Frt		1.00			1.00			0.86		1.00	1.00	0.85
Flt Protected		1.00			1.00			1.00		0.95	0.95	1.00
Satd. Flow (prot)		3536			3539			1611		1681	1681	1493
Flt Permitted		1.00			1.00			1.00		0.75	0.75	1.00
Satd. Flow (perm)		3536			3539			1611		1335	1335	1493
Volume (vph)	0	685	5	0	855	0	0	0	5	185	0	185
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	102%	100%	100%
Adj. Flow (vph)	0	721	5	0	900	0	0	0	5	199	0	195
RTOR Reduction (vph)	0	0	0	0	0	0	0	4	0	0	0	79
Lane Group Flow (vph)	0	726	0	0	900	0	0	1	0	100	99	116
Confl. Peds. (#/hr)								36				19
Confl. Bikes (#/hr)								6				16
Turn Type				Perm		Perm			Perm		Perm	
Protected Phases		2			6			8			4	
Permitted Phases				6			8			4		4
Actuated Green, G (s)		79.5			79.5			15.6		14.7	14.7	14.7
Effective Green, g (s)		80.4			80.4			15.6		15.6	15.6	15.6
Actuated g/C Ratio		0.77			0.77			0.15		0.15	0.15	0.15
Clearance Time (s)		4.9			4.9			4.0		4.9	4.9	4.9
Vehicle Extension (s)		3.0			3.0			3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		2734			2736			242		200	200	224
v/s Ratio Prot		0.21			0.25			0.00				
v/s Ratio Perm										0.07	0.07	0.08
v/c Ratio		0.27			0.33			0.00		0.50	0.49	0.52
Uniform Delay, d1		3.4			3.6			37.6		40.6	40.6	40.7
Progression Factor		1.04			1.00			1.00		1.00	1.00	1.00
Incremental Delay, d2		0.2			0.3			0.0		2.0	1.9	2.0
Delay (s)		3.7			3.9			37.6		42.6	42.5	42.7
Level of Service		A			A			D		D	D	D
Approach Delay (s)		3.7			3.9			37.6			42.6	
Approach LOS		A			A			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			11.5									B
HCM Volume to Capacity ratio			0.36									
Actuated Cycle Length (s)			104.0							8.0		
Intersection Capacity Utilization			54.2%									A
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
7: Washington St & Fourth Ave

10/17/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗					↖	↗	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0					4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		0.97	0.95					0.95	0.95	1.00
Frbp, ped/bikes	1.00	0.99		1.00	0.99					1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00					1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.99					1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00					0.95	0.99	1.00
Satd. Flow (prot)	1770	3390		3433	3454					1681	1754	1529
Flt Permitted	0.95	1.00		0.95	1.00					0.95	0.99	1.00
Satd. Flow (perm)	1770	3390		3433	3454					1681	1754	1529
Volume (vph)	110	555	125	295	1250	130	0	0	0	245	180	130
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	584	132	311	1316	137	0	0	0	258	189	137
RTOR Reduction (vph)	0	14	0	0	5	0	0	0	0	0	0	112
Lane Group Flow (vph)	116	702	0	311	1448	0	0	0	0	218	229	25
Confl. Peds. (#/hr)			43			35						10
Confl. Bikes (#/hr)			10			10			1			10
Turn Type	Prot		Prot						Perm		Perm	
Protected Phases	5	2		1	6						4	4
Permitted Phases										4		4
Actuated Green, G (s)	9.5	59.5		12.5	62.5					17.8	17.8	17.8
Effective Green, g (s)	9.9	60.4		12.9	63.4					18.7	18.7	18.7
Actuated g/C Ratio	0.10	0.58		0.12	0.61					0.18	0.18	0.18
Clearance Time (s)	4.4	4.9		4.4	4.9					4.9	4.9	4.9
Vehicle Extension (s)	2.0	0.2		1.0	0.2					1.0	1.0	1.0
Lane Grp Cap (vph)	168	1969		426	2106					302	315	275
v/s Ratio Prot	c0.07	0.21		0.09	c0.42							
v/s Ratio Perm										0.13	0.13	0.02
v/c Ratio	0.69	0.36		0.73	0.69					0.72	0.73	0.09
Uniform Delay, d1	45.6	11.5		43.9	13.6					40.2	40.2	35.6
Progression Factor	1.00	1.00		1.05	1.04					1.00	1.00	1.00
Incremental Delay, d2	9.4	0.5		4.6	1.5					7.0	6.9	0.1
Delay (s)	55.0	12.0		50.7	15.7					47.2	47.2	35.6
Level of Service	E	B		D	B					D	D	D
Approach Delay (s)		18.0			21.9			0.0			44.5	
Approach LOS		B			C			A			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			25.0			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)		104.0				Sum of lost time (s)		12.0				
Intersection Capacity Utilization		70.7%				ICU Level of Service				C		
Analysis Period (min)		15										
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis  
 11: Washington St & SR-163 Off-Ramp

10/17/2013

	→	↘	←	↙	↖	↑	↗	↘	↓	↙	↖	↻
Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR	SWR	SWR2
Lane Configurations	↑↑		↑↑			↕			↕			↕
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0			4.0		4.0	
Lane Util. Factor	0.95		0.95			1.00			1.00		1.00	
Frbp, ped/bikes	0.99		1.00			1.00			1.00		1.00	
Flpb, ped/bikes	1.00		1.00			1.00			1.00		1.00	
Frt	0.99		1.00			0.97			0.97		0.86	
Flt Protected	1.00		1.00			0.97			0.98		1.00	
Satd. Flow (prot)	3472		3533			1749			1758		1611	
Flt Permitted	1.00		1.00			0.83			0.86		1.00	
Satd. Flow (perm)	3472		3533			1496			1543		1611	
Volume (vph)	800	75	960	10	60	10	20	20	15	10	615	15
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	842	79	1011	11	63	11	21	21	16	11	647	16
RTOR Reduction (vph)	7	0	0	0	0	13	0	0	10	0	1	0
Lane Group Flow (vph)	914	0	1022	0	0	82	0	0	38	0	662	0
Confl. Peds. (#/hr)		18		1						7		
Turn Type					Perm			Perm			custom	
Protected Phases	2		6			8			4		5	
Permitted Phases					8			4				
Actuated Green, G (s)	37.6		37.6			10.1			9.6		38.8	
Effective Green, g (s)	38.6		38.6			10.1			10.1		39.3	
Actuated g/C Ratio	0.39		0.39			0.10			0.10		0.39	
Clearance Time (s)	5.0		5.0			4.0			4.5		4.5	
Vehicle Extension (s)	2.0		2.0			0.9			2.0		2.0	
Lane Grp Cap (vph)	1340		1364			151			156		633	
v/s Ratio Prot	0.26		c0.29								c0.41	
v/s Ratio Perm						c0.06			0.02			
v/c Ratio	0.68		0.75			0.55			0.24		1.05	
Uniform Delay, d1	25.6		26.5			42.8			41.4		30.4	
Progression Factor	1.00		1.00			1.00			1.00		1.00	
Incremental Delay, d2	2.8		3.8			2.2			0.3		48.5	
Delay (s)	28.4		30.3			44.9			41.7		78.9	
Level of Service	C		C			D			D		E	
Approach Delay (s)	28.4		30.3			44.9			41.7			
Approach LOS	C		C			D			D			
<b>Intersection Summary</b>												
HCM Average Control Delay			42.1			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.86									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			84.1%			ICU Level of Service			E			
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis

14: Normal St & Park Blvd

10/17/2013

<b>Movement</b>	<b>EBL</b>	<b>EBT</b>	<b>EBR</b>	<b>WBL</b>	<b>WBT</b>	<b>WBR</b>	<b>NBL</b>	<b>NBT</b>	<b>NBR</b>	<b>SBL</b>	<b>SBT</b>	<b>SBR</b>
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	0.85
Fl t Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1529	1770	3539	1534	1770	3539	1528	1770	3144	1441
Fl t Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1529	1770	3539	1534	1770	3539	1528	1770	3144	1441
Volume (vph)	190	230	50	145	565	80	55	110	85	45	195	375
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	242	53	153	595	84	58	116	89	47	205	395
RTOR Reduction (vph)	0	0	37	0	0	57	0	0	0	0	137	148
Lane Group Flow (vph)	200	242	16	153	595	27	58	116	89	47	261	54
Confl. Peds. (#/hr)			5			16			38			
Confl. Bikes (#/hr)			25			16			1			
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Prot
Protected Phases	5	2		1	6		3	8		7	4	4
Permitted Phases			2			6			8			
Actuated Green, G (s)	7.3	21.3	21.3	9.0	22.5	22.5	4.0	19.7	19.7	2.3	18.0	18.0
Effective Green, g (s)	9.2	23.2	23.2	10.4	24.4	24.4	5.4	21.6	21.6	3.7	19.9	19.9
Actuated g/C Ratio	0.12	0.31	0.31	0.14	0.33	0.33	0.07	0.29	0.29	0.05	0.27	0.27
Clearance Time (s)	5.9	5.9	5.9	5.4	5.9	5.9	5.4	5.9	5.9	5.4	5.9	5.9
Vehicle Extension (s)	2.0	4.8	4.8	2.0	3.8	3.8	2.0	3.5	3.5	2.0	3.9	3.9
Lane Grp Cap (vph)	422	1096	474	246	1153	500	128	1021	441	87	835	383
v/s Ratio Prot	0.06	0.07		c0.09	c0.17		c0.03	0.03		0.03	c0.08	0.04
v/s Ratio Perm			0.01			0.02			0.06			
v/c Ratio	0.47	0.22	0.03	0.62	0.52	0.05	0.45	0.11	0.20	0.54	0.31	0.14
Uniform Delay, d1	30.6	19.2	18.0	30.4	20.5	17.3	33.3	19.6	20.1	34.8	22.0	21.0
Progression 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
Incremental Delay, d2	0.3	0.2	0.1	3.5	0.5	0.1	0.9	0.1	0.3	3.6	0.3	0.2
Delay (s)	30.9	19.4	18.1	33.9	21.0	17.4	34.3	19.7	20.4	38.4	22.3	21.2
Level of Service	C	B	B	C	C	C	B	C	B	D	C	C
Approach Delay (s)		23.9			23.0			23.1			23.1	
Approach LOS		C			C			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.2									HCM Level of Service C
HCM Volume to Capacity ratio			0.44									
Actuated Cycle Length (s)			74.9							12.0		Sum of lost time (s)
Intersection Capacity Utilization			70.1%									ICU Level of Service C
Analysis Period (min)			15									
c Critical Lane Group												




HCM Signalized Intersection Capacity Analysis  
15: University Ave & First Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frbp, ped/bikes		0.98			0.98			0.99			0.98	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.96			0.97			0.98			0.97	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1749			1764			1776			1765	
Flt Permitted		0.95			0.94			0.76			0.91	
Satd. Flow (perm)		1659			1663			1383			1613	
Volume (vph)	35	335	135	45	400	115	195	215	60	35	150	45
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	37	353	142	47	421	121	205	226	63	37	158	47
RTOR Reduction (vph)	0	24	0	0	17	0	0	11	0	0	17	0
Lane Group Flow (vph)	0	508	0	0	572	0	0	483	0	0	225	0
Confl. Peds. (#/hr)			37				52			34		51
Confl. Bikes (#/hr)			7				6			5		4
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		22.3			22.3			19.9			19.9	
Effective Green, g (s)		23.2			23.2			20.8			20.8	
Actuated g/C Ratio		0.45			0.45			0.40			0.40	
Clearance Time (s)		4.9			4.9			4.9			4.9	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		740			742			553			645	
v/s Ratio Prot												
v/s Ratio Perm		0.31			0.34			0.35			0.14	
v/c Ratio		0.69			0.77			0.87			0.35	
Uniform Delay, d1		11.5			12.2			14.4			10.9	
Progression Factor		1.00			1.03			1.00			1.00	
Incremental Delay, d2		5.1			6.7			13.9			0.1	
Delay (s)		16.6			19.2			28.3			11.0	
Level of Service		B			B			C			B	
Approach Delay (s)		16.6			19.2			28.3			11.0	
Approach LOS		B			B			C			B	
<b>Intersection Summary</b>												
HCM Average Control Delay		19.8			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.82										
Actuated Cycle Length (s)		52.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		92.3%			ICU Level of Service			F				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
16: University Ave & Fourth Ave

10/17/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔						↔↔	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0						4.0	
Lane Util. Factor		1.00		1.00	1.00						0.95	
Frpb, ped/bikes		0.99		1.00	1.00						0.99	
Flpb, ped/bikes		1.00		1.00	1.00						1.00	
Frt		0.98		1.00	1.00						0.99	
Flt Protected		1.00		0.95	1.00						1.00	
Satd. Flow (prot)		1804		1770	1863						3488	
Flt Permitted		1.00		0.35	1.00						1.00	
Satd. Flow (perm)		1804		649	1863						3488	
Volume (vph)	0	400	65	100	600	0	0	0	0	20	470	20
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	421	68	105	632	0	0	0	0	21	495	21
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	0	485	0	105	632	0	0	0	0	0	534	0
Confl. Peds. (#/hr)			47			49			21			55
Confl. Bikes (#/hr)			3			1						3
Turn Type				pm+pt						Perm		
Protected Phases		2		1	6							4
Permitted Phases				6						4		
Actuated Green, G (s)		56.6		69.2	69.2							21.2
Effective Green, g (s)		57.5		70.1	70.1							22.1
Actuated g/C Ratio		0.55		0.67	0.67							0.21
Clearance Time (s)		4.9		4.4	4.9							4.9
Vehicle Extension (s)		2.0		3.0	2.0							2.0
Lane Grp Cap (vph)		997		530	1256							741
v/s Ratio Prot		0.27		0.02	0.34							
v/s Ratio Perm				0.12								0.15
v/c Ratio		0.49		0.20	0.50							0.72
Uniform Delay, d1		14.2		7.5	8.4							38.1
Progression Factor		0.87		1.21	1.47							1.00
Incremental Delay, d2		1.3		0.2	0.1							2.9
Delay (s)		13.7		9.2	12.4							41.0
Level of Service		B		A	B							D
Approach Delay (s)		13.7			11.9			0.0				41.0
Approach LOS		B			B			A				D
<b>Intersection Summary</b>												
HCM Average Control Delay			21.3			HCM Level of Service					C	
HCM Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			104.0			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			61.6%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis

17: University Ave & Fifth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖			↖↗	↖		↖↗↘				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0				
Lane Util. Factor		1.00			0.95	1.00		0.91				
Frbp, ped/bikes		1.00			1.00	0.74		0.96				
Flpb, ped/bikes		1.00			1.00	1.00		1.00				
Frt		1.00			1.00	0.85		0.96				
Flt Protected		1.00			1.00	1.00		0.99				
Satd. Flow (prot)		1859			3539	1170		4659				
Flt Permitted		0.94			1.00	1.00		0.99				
Satd. Flow (perm)		1758			3539	1170		4659				
Volume (vph)	25	530	0	0	810	325	85	375	165	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	558	0	0	853	342	89	395	174	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	75	0	63	0	0	0	0
Lane Group Flow (vph)	0	584	0	0	853	267	0	595	0	0	0	0
Confl. Peds. (#/hr)			134			136			97			91
Confl. Bikes (#/hr)			8			20			4			24
Turn Type	Perm					Perm	Perm					
Protected Phases		2			2			4				
Permitted Phases	2					2	4					
Actuated Green, G (s)		59.5			59.5	59.5		27.0				
Effective Green, g (s)		60.4			60.4	60.4		27.9				
Actuated g/C Ratio		0.58			0.58	0.58		0.27				
Clearance Time (s)		4.9			4.9	4.9		4.9				
Vehicle Extension (s)		1.0			1.0	1.0		1.0				
Lane Grp Cap (vph)		1021			2055	680		1250				
v/s Ratio Prot					0.24							
v/s Ratio Perm		0.33				0.23		0.13				
v/c Ratio		0.57			0.42	0.39		0.48				
Uniform Delay, d1		13.7			12.0	11.8		31.9				
Progression Factor		1.23			1.19	1.37		1.00				
Incremental Delay, d2		2.2			0.5	1.5		0.1				
Delay (s)		19.0			14.9	17.8		32.0				
Level of Service		B			B	B		C				
Approach Delay (s)		19.0			15.7			32.0			0.0	
Approach LOS		B			B			C			A	
<b>Intersection Summary</b>												
HCM Average Control Delay		20.9						HCM Level of Service				C
HCM Volume to Capacity ratio		0.50										
Actuated Cycle Length (s)		104.0						Sum of lost time (s)				8.0
Intersection Capacity Utilization		88.7%						ICU Level of Service				E
Analysis Period (min)		15										
c	Critical Lane Group											



HCM Signalized Intersection Capacity Analysis  
18: University Ave & Sixth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↔↔	↔↔		↔	↔↔	↔	↔	↔↔		↔	↔↔	↔	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	
Frpb, ped/bikes	1.00	0.97		1.00	1.00	0.90	1.00	1.00		1.00	1.00	0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Fr <sub>t</sub>	1.00	0.98		1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	3433	3380		1770	3539	1422	1770	3506		1770	3539	1523	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	
Satd. Flow (perm)	3433	3380		1770	3539	1422	1770	3506		1770	3539	1523	
Volume (vph)	500	200	30	170	470	255	50	730	40	220	1050	530	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	526	211	32	179	495	268	53	768	42	232	1105	558	
RTOR Reduction (vph)	0	11	0	0	0	12	0	4	0	0	0	74	
Lane Group Flow (vph)	526	232	0	179	495	256	53	806	0	232	1105	484	
Confl. Peds. (#/hr)			115			121			16			34	
Confl. Bikes (#/hr)			29			26			4			6	
Turn Type	Prot			Prot	pm+ov		Prot			Prot		pm+ov	
Protected Phases	5	2		1	6	7	3	8		7	4	5	
Permitted Phases						6						4	
Actuated Green, G (s)	11.2	27.7		12.7	29.2	44.2	6.1	29.5		15.0	38.4	49.6	
Effective Green, g (s)	11.6	28.6		13.1	30.1	45.5	6.5	30.9		15.4	39.8	51.4	
Actuated g/C Ratio	0.11	0.28		0.13	0.29	0.44	0.06	0.30		0.15	0.38	0.49	
Clearance Time (s)	4.4	4.9		4.4	4.9	4.4	4.4	5.4		4.4	5.4	4.4	
Vehicle Extension (s)	3.0	2.2		2.0	2.2	2.0	2.0	3.8		2.0	3.8	3.0	
Lane Grp Cap (vph)	383	930		223	1024	677	111	1042		262	1354	811	
v/s Ratio Prot	c0.15	0.07		0.10	c0.14	0.06	0.03	0.23		c0.13	c0.31	0.07	
v/s Ratio Perm						0.12						0.25	
v/c Ratio	1.37	0.25		0.80	0.48	0.38	0.48	0.77		0.89	0.82	0.60	
Uniform Delay, d1	46.2	29.3		44.2	30.5	19.7	47.1	33.4		43.4	28.8	18.9	
Progression Factor	0.76	1.07		1.20	1.14	0.57	1.00	1.00		1.00	1.00	1.00	
Incremental Delay, d2	181.9	0.6		17.1	1.6	0.1	1.2	3.8		27.2	4.1	1.2	
Delay (s)	216.8	32.0		70.2	36.3	11.5	48.3	37.2		70.7	32.9	20.1	
Level of Service	F	C		E	D	B	D	D		E	C	C	
Approach Delay (s)		158.4			35.7			37.9			33.7		
Approach LOS		F			D			D			C		
<b>Intersection Summary</b>													
HCM Average Control Delay			56.4									HCM Level of Service	E
HCM Volume to Capacity ratio			0.74										
Actuated Cycle Length (s)			104.0									Sum of lost time (s)	8.0
Intersection Capacity Utilization			84.7%									ICU Level of Service	E
Analysis Period (min)			15										
c Critical Lane Group													



HCM Signalized Intersection Capacity Analysis

19: University Ave & Seventh Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frbp, ped/bikes		0.94			0.99			0.97			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.98			1.00			0.94			0.94	
Flt Protected		1.00			1.00			0.98			0.98	
Satd. Flow (prot)		3235			3497			1670			1704	
Flt Permitted		0.89			0.88			0.87			0.90	
Satd. Flow (perm)		2896			3090			1482			1564	
Volume (vph)	25	410	80	50	725	15	30	5	25	20	10	25
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	432	84	53	763	16	32	5	26	21	11	26
RTOR Reduction (vph)	0	7	0	0	1	0	0	23	0	0	23	0
Lane Group Flow (vph)	0	535	0	0	831	0	0	40	0	0	35	0
Confl. Peds. (#/hr)			116			87			35			4
Confl. Bikes (#/hr)			35			22			3			1
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		82.6			82.6			11.6			11.6	
Effective Green, g (s)		83.5			83.5			12.5			12.5	
Actuated g/C Ratio		0.80			0.80			0.12			0.12	
Clearance Time (s)		4.9			4.9			4.9			4.9	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		2325			2481			178			188	
v/s Ratio Prot												
v/s Ratio Perm		0.18			0.27			0.03			0.02	
v/c Ratio		0.23			0.34			0.23			0.19	
Uniform Delay, d1		2.5			2.8			41.4			41.2	
Progression Factor		0.30			0.13			1.00			1.00	
Incremental Delay, d2		0.2			0.3			0.2			0.2	
Delay (s)		0.9			0.7			41.6			41.4	
Level of Service		A			A			D			D	
Approach Delay (s)		0.9			0.7			41.6			41.4	
Approach LOS		A			A			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay		4.1			HCM Level of Service			A				
HCM Volume to Capacity ratio		0.32										
Actuated Cycle Length (s)		104.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		62.9%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
20: University Ave & Eighth St

10/17/2013

	↖	→	↗	↖	←	↖	↗	↑	↖	↗	↓	↖
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frbp, ped/bikes		0.99			1.00			0.93			0.93	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.92			0.92	
Flt Protected		1.00			1.00			0.98			0.98	
Satd. Flow (prot)		3437			3497			1555			1565	
Flt Permitted		0.91			0.88			0.76			0.85	
Satd. Flow (perm)		3143			3081			1206			1366	
Volume (vph)	15	390	45	60	770	50	10	0	15	45	0	60
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	16	411	47	63	811	53	11	0	16	47	0	63
RTOR Reduction (vph)	0	6	0	0	3	0	0	14	0	0	50	0
Lane Group Flow (vph)	0	468	0	0	924	0	0	13	0	0	60	0
Confl. Peds. (#/hr)			38						70			65
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			3			4	
Permitted Phases	2			2			3			4		
Actuated Green, G (s)		62.0			62.0			11.4			12.9	
Effective Green, g (s)		63.9			63.9			13.3			14.8	
Actuated g/C Ratio		0.61			0.61			0.13			0.14	
Clearance Time (s)		5.9			5.9			5.9			5.9	
Vehicle Extension (s)		1.0			1.0			2.0			2.0	
Lane Grp Cap (vph)		1931			1893			154			194	
v/s Ratio Prot												
v/s Ratio Perm		0.15			c0.30			c0.01			c0.04	
v/c Ratio		0.24			0.49			0.08			0.31	
Uniform Delay, d1		9.1			11.0			40.0			40.0	
Progression Factor		1.27			0.66			1.00			1.00	
Incremental Delay, d2		0.3			0.9			0.1			0.3	
Delay (s)		11.8			8.2			40.1			40.4	
Level of Service		B			A			D			D	
Approach Delay (s)		11.8			8.2			40.1			40.4	
Approach LOS		B			A			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			12.2									HCM Level of Service B
HCM Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			104.0									Sum of lost time (s) 12.0
Intersection Capacity Utilization			65.2%									ICU Level of Service C
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
21: University Ave & Ninth St

10/17/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕		↗	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		0.95	0.95		1.00	1.00
Frbp, ped/bikes		1.00	0.99		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3535	3511		1770	1532
Flt Permitted		0.93	1.00		0.95	1.00
Satd. Flow (perm)		3300	3511		1770	1532
Volume (vph)	10	400	790	15	125	105
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	421	832	16	132	111
RTOR Reduction (vph)	0	0	1	0	0	63
Lane Group Flow (vph)	0	432	847	0	132	48
Confl. Peds. (#/hr)				94		10
Confl. Bikes (#/hr)				23		3
Turn Type	Perm				Perm	
Protected Phases		2	6		4	
Permitted Phases	2					4
Actuated Green, G (s)		82.0	82.0		12.7	12.7
Effective Green, g (s)		82.9	82.9		13.1	13.1
Actuated g/C Ratio		0.80	0.80		0.13	0.13
Clearance Time (s)		4.9	4.9		4.4	4.4
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	2630	2799			223	193
v/s Ratio Prot			c0.24		c0.07	
v/s Ratio Perm		0.13				0.03
v/c Ratio		0.16	0.30		0.59	0.25
Uniform Delay, d1		2.5	2.8		42.9	41.0
Progression Factor		0.35	0.39		1.00	1.00
Incremental Delay, d2		0.1	0.1		4.2	0.7
Delay (s)		1.0	1.2		47.1	41.7
Level of Service		A	A		D	D
Approach Delay (s)		1.0	1.2		44.6	
Approach LOS		A	A		D	
<b>Intersection Summary</b>						
HCM Average Control Delay			8.0		HCM Level of Service	A
HCM Volume to Capacity ratio			0.34			
Actuated Cycle Length (s)			104.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			39.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						



HCM Signalized Intersection Capacity Analysis  
22: University Ave & Tenth St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗	↖	↖	↖	↖	↖	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.97		1.00	1.00	0.66	1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.94		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	3350		1770	3539	1053	1770	1703		1770	1704	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.71	1.00		0.73	1.00	
Satd. Flow (perm)	1787	3350		1770	3539	1053	1314	1703		1365	1704	
Volume (vph)	50	405	75	190	635	15	100	20	15	5	40	35
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	53	426	79	200	668	16	105	21	16	5	42	37
RTOR Reduction (vph)	0	11	0	0	0	4	0	13	0	0	31	0
Lane Group Flow (vph)	53	494	0	200	668	12	105	24	0	5	48	0
Confl. Peds. (#/hr)			69			102			35			19
Confl. Bikes (#/hr)			30			24			2			1
Heavy Vehicles (%)	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot			Prot		Perm	Perm			Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases						6	8			4		
Actuated Green, G (s)	6.3	59.6		14.3	67.6	67.6	15.9	15.9		15.9	15.9	
Effective Green, g (s)	6.7	60.5		14.7	68.5	68.5	16.8	16.8		16.8	16.8	
Actuated g/C Ratio	0.06	0.58		0.14	0.66	0.66	0.16	0.16		0.16	0.16	
Clearance Time (s)	4.4	4.9		4.4	4.9	4.9	4.9	4.9		4.9	4.9	
Vehicle Extension (s)	2.0	5.3		2.0	3.4	3.4	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	115	1949		250	2331	694	212	275		221	275	
v/s Ratio Prot	0.03	0.15		c0.11	c0.19			0.01			0.03	
v/s Ratio Perm						0.01	c0.08			0.00		
v/c Ratio	0.46	0.25		0.80	0.29	0.02	0.50	0.09		0.02	0.17	
Uniform Delay, d1	46.9	10.7		43.2	7.5	6.1	39.7	37.1		36.7	37.6	
Progression Factor	0.96	0.77		1.45	0.17	0.01	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.3		14.9	0.3	0.0	0.7	0.0		0.0	0.1	
Delay (s)	45.9	8.6		77.8	1.5	0.1	40.4	37.1		36.7	37.7	
Level of Service	D	A		E	A	A	D	D		D	D	
Approach Delay (s)		12.1			18.8			39.5			37.7	
Approach LOS		B			B			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			19.3	HCM Level of Service				B				
HCM Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			104.0	Sum of lost time (s)				8.0				
Intersection Capacity Utilization			59.3%	ICU Level of Service				B				
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
23: University Ave & Vermont St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷	↷	↶	↷		↶	↷	↷
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frbp, ped/bikes	1.00	0.99		1.00	1.00	0.76	1.00	0.98		1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1593	3147		1593	3185	1090	1593	1526		1593	1676	1325
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.73	1.00		0.73	1.00	1.00
Satd. Flow (perm)	1593	3147		1593	3185	1090	1229	1526		1218	1676	1325
Volume (vph)	35	380	15	35	775	45	5	25	20	20	35	70
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	37	400	16	37	816	47	5	26	21	21	37	74
RTOR Reduction (vph)	0	2	0	0	0	18	0	17	0	0	0	59
Lane Group Flow (vph)	37	414	0	37	816	29	5	30	0	21	37	15
Confl. Peds. (#/hr)			46			86			34			56
Confl. Bikes (#/hr)			27			14			11			3
Turn Type	Prot			Prot		Perm	Perm			Perm		Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases						6	8			4		4
Actuated Green, G (s)	4.9	64.0		5.0	64.1	64.1	20.8	20.8		20.8	20.8	20.8
Effective Green, g (s)	5.3	64.9		5.4	65.0	65.0	21.7	21.7		21.7	21.7	21.7
Actuated g/C Ratio	0.05	0.62		0.05	0.62	0.62	0.21	0.21		0.21	0.21	0.21
Clearance Time (s)	4.4	4.9		4.4	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)	2.0	3.2		2.0	3.4	3.4	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	81	1964		83	1991	681	256	318		254	350	276
v/s Ratio Prot	c0.02	0.13		0.02	c0.26			0.02			c0.02	
v/s Ratio Perm						0.03	0.00			0.02		0.01
v/c Ratio	0.46	0.21		0.45	0.41	0.04	0.02	0.10		0.08	0.11	0.06
Uniform Delay, d1	48.0	8.5		47.8	9.8	7.5	32.7	33.2		33.1	33.3	32.9
Progression Factor	0.97	1.28		1.28	0.39	0.08	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.5	0.2		1.3	0.6	0.1	0.0	0.1		0.1	0.1	0.1
Delay (s)	48.1	11.0		62.4	4.4	0.7	32.7	33.4		33.3	33.4	33.0
Level of Service	D	B		E	A	A	C	C		C	C	C
Approach Delay (s)		14.1			6.6			33.3			33.2	
Approach LOS		B			A			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			12.0									B
HCM Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			104.0							8.0		
Intersection Capacity Utilization			62.9%									B
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
 24: University Ave & Richmond St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0		
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00		
Frpb, ped/bikes	1.00	0.96		1.00	1.00	0.80	1.00	0.98		1.00	0.98		
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Fr t	1.00	0.99		1.00	1.00	0.85	1.00	0.95		1.00	0.94		
Fl t Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1770	3364		1770	3539	1269	1770	1739		1770	1720		
Fl t Permitted	0.95	1.00		0.95	1.00	1.00	0.52	1.00		0.69	1.00		
Satd. Flow (perm)	1770	3364		1770	3539	1269	961	1739		1284	1720		
Volume (vph)	65	320	35	30	720	80	25	60	30	45	115	70	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	68	337	37	32	758	84	26	63	32	47	121	74	
RTOR Reduction (vph)	0	6	0	0	0	34	0	21	0	0	26	0	
Lane Group Flow (vph)	68	368	0	32	758	50	26	74	0	47	169	0	
Confl. Peds. (#/hr)			127			69			43			52	
Confl. Bikes (#/hr)			26			20			6			3	
Turn Type	Prot			Prot		Perm	Perm			Perm			
Protected Phases	5	2		1	6			8				4	
Permitted Phases						6	8			4			
Actuated Green, G (s)	7.4	58.4		4.4	55.4	55.4	27.0	27.0		27.0	27.0		
Effective Green, g (s)	7.8	59.3		4.8	56.3	56.3	27.9	27.9		27.9	27.9		
Actuated g/C Ratio	0.07	0.57		0.05	0.54	0.54	0.27	0.27		0.27	0.27		
Clearance Time (s)	4.4	4.9		4.4	4.9	4.9	4.9	4.9		4.9	4.9		
Vehicle Extension (s)	2.0	3.2		2.0	3.1	3.1	2.0	2.0		2.0	2.0		
Lane Grp Cap (vph)	133	1918		82	1916	687	258	467		344	461		
v/s Ratio Prot	c0.04	c0.11		0.02	c0.21			0.04			c0.10		
v/s Ratio Perm						0.04	0.03			0.04			
v/c Ratio	0.51	0.19		0.39	0.40	0.07	0.10	0.16		0.14	0.37		
Uniform Delay, d1	46.3	10.8		48.2	13.9	11.4	28.6	29.1		28.9	30.9		
Progression Factor	1.19	1.08		1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2	1.4	0.2		1.1	0.6	0.2	0.1	0.1		0.1	0.2		
Delay (s)	56.3	11.9		49.3	14.5	11.6	28.7	29.1		29.0	31.1		
Level of Service	E	B		D	B	B	C	C		C	C		
Approach Delay (s)		18.7			15.5			29.0			30.7		
Approach LOS		B			B			C			C		
<b>Intersection Summary</b>													
HCM Average Control Delay			19.5									HCM Level of Service	B
HCM Volume to Capacity ratio			0.41										
Actuated Cycle Length (s)			104.0									Sum of lost time (s)	16.0
Intersection Capacity Utilization			63.2%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis  
25: University Ave & Normal St

10/17/2013

	↖	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↕	↕		↘	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00		1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	3472		1770	1493
Flt Permitted	0.38	1.00	1.00		0.95	1.00
Satd. Flow (perm)	711	3539	3472		1770	1493
Volume (vph)	45	305	570	60	55	70
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	47	321	600	63	58	74
RTOR Reduction (vph)	0	0	6	0	0	56
Lane Group Flow (vph)	47	321	657	0	58	18
Confl. Peds. (#/hr)				58		75
Confl. Bikes (#/hr)				20		1
Turn Type	Perm				Perm	
Protected Phases		2	6		4	
Permitted Phases	2					4
Actuated Green, G (s)	46.1	46.1	46.1		17.0	17.0
Effective Green, g (s)	47.0	47.0	47.0		17.4	17.4
Actuated g/C Ratio	0.65	0.65	0.65		0.24	0.24
Clearance Time (s)	4.9	4.9	4.9		4.4	4.4
Vehicle Extension (s)	4.8	4.8	3.9		2.0	2.0
Lane Grp Cap (vph)	462	2297	2254		425	359
v/s Ratio Prot		0.09	c0.19		c0.03	
v/s Ratio Perm	0.07					0.01
v/c Ratio	0.10	0.14	0.29		0.14	0.05
Uniform Delay, d1	4.8	4.9	5.5		21.6	21.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	0.1	0.1		0.1	0.0
Delay (s)	5.0	5.0	5.6		21.7	21.2
Level of Service	A	A	A		C	C
Approach Delay (s)		5.0	5.6		21.4	
Approach LOS		A	A		C	
<b>Intersection Summary</b>						
HCM Average Control Delay			7.2		HCM Level of Service	A
HCM Volume to Capacity ratio			0.25			
Actuated Cycle Length (s)			72.4		Sum of lost time (s)	8.0
Intersection Capacity Utilization			71.9%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						



HCM Signalized Intersection Capacity Analysis  
26: University Ave & Park Blvd

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖↗		↖	↖↗	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	0.99		1.00	0.99		1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.98		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3340		1770	3428		1770	3357		1770	3539	1476
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3340		1770	3428		1770	3357		1770	3539	1476
Volume (vph)	40	215	80	115	505	100	85	150	55	50	290	55
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	226	84	121	532	105	89	158	58	53	305	58
RTOR Reduction (vph)	0	37	0	0	14	0	0	40	0	0	0	43
Lane Group Flow (vph)	42	273	0	121	623	0	89	176	0	53	305	15
Confl. Peds. (#/hr)			68			42			43			60
Confl. Bikes (#/hr)			8			8			8			8
Turn Type	Prot			Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												4
Actuated Green, G (s)	2.0	25.6		7.8	31.4		5.4	21.2		2.9	18.7	18.7
Effective Green, g (s)	2.4	26.5		8.2	32.3		5.8	22.1		3.3	19.6	19.6
Actuated g/C Ratio	0.03	0.35		0.11	0.42		0.08	0.29		0.04	0.26	0.26
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	4.9		4.4	4.9	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	3.3		2.0	2.9	2.9
Lane Grp Cap (vph)	56	1163		191	1455		135	975		77	911	380
v/s Ratio Prot	0.02	0.08		c0.07	c0.18		c0.05	0.05		0.03	c0.09	
v/s Ratio Perm												0.01
v/c Ratio	0.75	0.23		0.63	0.43		0.66	0.18		0.69	0.33	0.04
Uniform Delay, d1	36.6	17.6		32.5	15.4		34.2	20.2		35.9	23.0	21.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	42.7	0.0		6.7	0.1		11.1	0.1		18.4	0.2	0.0
Delay (s)	79.2	17.6		39.2	15.5		45.3	20.3		54.3	23.2	21.2
Level of Service	E	B		D	B		D	C		D	C	C
Approach Delay (s)		25.0			19.3			27.6			26.9	
Approach LOS		C			B			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.5				HCM Level of Service				C	
HCM Volume to Capacity ratio			0.43									
Actuated Cycle Length (s)			76.1				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			75.3%				ICU Level of Service			D		
Analysis Period (min)			15									
c	Critical Lane Group											



HCM Signalized Intersection Capacity Analysis  
 27: Washington St & SR-163 On-Ramp

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Grade (%)		0%			0%			1%			0%		
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0			4.0				
Lane Util. Factor	1.00	0.91	1.00		0.91	0.91			1.00				
Frbp, ped/bikes	1.00	1.00	0.98		0.99	0.99			1.00				
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00			1.00				
Frt	1.00	1.00	0.85		0.92	0.85			0.86				
Flt Protected	0.95	1.00	1.00		1.00	1.00			1.00				
Satd. Flow (prot)	1770	5085	1544		3113	1423			1603				
Flt Permitted	0.95	1.00	1.00		1.00	1.00			1.00				
Satd. Flow (perm)	1770	5085	1544		3113	1423			1603				
Volume (vph)	470	860	165	0	730	1535	0	0	15	0	0	0	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	495	905	174	0	768	1616	0	0	16	0	0	0	
RTOR Reduction (vph)	0	0	0	0	89	127	0	0	0	0	0	0	
Lane Group Flow (vph)	495	905	174	0	1465	703	0	0	16	0	0	0	
Confl. Peds. (#/hr)			1									1	
Confl. Bikes (#/hr)			11			2							
Turn Type	Prot		Perm			Perm			custom				
Protected Phases	5	2				6							
Permitted Phases			2			6			2				
Actuated Green, G (s)	33.1	116.0	116.0		73.6	73.6			116.0				
Effective Green, g (s)	33.5	116.0	116.0		74.5	74.5			116.0				
Actuated g/C Ratio	0.29	1.00	1.00		0.64	0.64			1.00				
Clearance Time (s)	4.4	2.0	2.0		4.9	4.9			2.0				
Vehicle Extension (s)	2.0	3.0	3.0		2.8	2.8			3.0				
Lane Grp Cap (vph)	511	5085	1544		1999	914			1603				
v/s Ratio Prot	c0.28	0.18			0.47								
v/s Ratio Perm			0.11			c0.49			0.01				
v/c Ratio	0.97	0.18	0.11		0.73	0.77			0.01				
Uniform Delay, d1	40.7	0.0	0.0		14.0	14.7			0.0				
Progression Factor	1.00	1.00	1.00		1.00	1.00			1.00				
Incremental Delay, d2	31.4	0.1	0.1		2.4	6.2			0.0				
Delay (s)	72.1	0.1	0.1		16.4	20.9			0.0				
Level of Service	E	A	A		B	C			A				
Approach Delay (s)		22.7			18.0			0.0			0.0		
Approach LOS		C			B			A			A		
<b>Intersection Summary</b>													
HCM Average Control Delay			19.8									HCM Level of Service	B
HCM Volume to Capacity ratio			0.83										
Actuated Cycle Length (s)			116.0									Sum of lost time (s)	8.0
Intersection Capacity Utilization			96.1%									ICU Level of Service	F
Analysis Period (min)			15										

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
28: Washington St & Lincoln Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗↖			↗↖		↖	↗			↖	↗
Ideal Flow (yphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	0.91			0.91		1.00	1.00			1.00	1.00
Frbp, ped/bikes	1.00	0.99			1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frnt	1.00	0.97			1.00		1.00	1.00			1.00	0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1770	4877			5077		1770	1863			1842	1583
Flt Permitted	0.95	1.00			1.00		0.95	1.00			0.99	1.00
Satd. Flow (perm)	1770	4877			5077		1770	1863			1842	1583
Volume (vph)	60	640	175	0	1665	15	375	10	0	10	35	295
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	674	184	0	1753	16	395	11	0	11	37	311
RTOR Reduction (vph)	0	23	0	0	1	0	0	0	0	0	0	296
Lane Group Flow (vph)	63	835	0	0	1768	0	395	11	0	0	48	15
Confl. Peds. (#/hr)			6				4		19			
Confl. Bikes (#/hr)			7				3					1
Turn Type	Prot					Split				Split		Prot
Protected Phases	5	2			6	3	3			4	4	4
Permitted Phases												
Actuated Green, G (s)	8.7	88.7			75.5	29.6	29.6				7.0	7.0
Effective Green, g (s)	9.1	89.6			76.5	30.5	30.5				7.9	7.9
Actuated g/C Ratio	0.06	0.56			0.48	0.19	0.19				0.05	0.05
Clearance Time (s)	4.4	4.9			5.0	4.9	4.9				4.9	4.9
Vehicle Extension (s)	2.0	5.7			6.0	3.0	3.0				2.0	2.0
Lane Grp Cap (vph)	101	2731			2427	337	355				91	78
v/s Ratio Prot	c0.04	0.17			c0.35	c0.22	0.01				c0.03	0.01
v/s Ratio Perm												
v/c Ratio	0.62	0.31			0.73	1.17	0.03				0.53	0.20
Uniform Delay, d1	73.8	18.7			33.4	64.8	52.7				74.2	73.0
Progression Factor	1.00	1.00			1.00	1.00	1.00				1.00	1.00
Incremental Delay, d2	8.3	0.3			1.6	104.4	0.0				2.5	0.5
Delay (s)	82.1	19.0			35.0	169.2	52.8				76.8	73.5
Level of Service	F	B			D	F	D				E	E
Approach Delay (s)		23.3			35.0		166.0				73.9	
Approach LOS		C			D		F				E	
<b>Intersection Summary</b>												
HCM Average Control Delay			51.3			HCM Level of Service					D	
HCM Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			160.0			Sum of lost time (s)				36.0		
Intersection Capacity Utilization			81.5%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
32: Robinson Ave & Park Blvd

10/17/2013

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL2	SBL	SBT
Movement												
Lane Configurations	↖	↗			↕			↕			↘	↙
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00			0.95			1.00	0.95
Frbp, ped/bikes	1.00	0.99			0.99			1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	0.97			0.96			1.00			1.00	0.99
Flt Protected	0.95	1.00			1.00			0.99			0.95	1.00
Satd. Flow (prot)	1770	1785			1762			3472			1770	3493
Flt Permitted	0.55	1.00			0.97			0.73			0.51	1.00
Satd. Flow (perm)	1022	1785			1716			2560			956	3493
Volume (vph)	30	40	10	25	160	85	105	270	10	55	15	565
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	42	11	26	168	89	111	284	11	58	16	595
RTOR Reduction (vph)	0	0	0	0	33	0	0	0	0	0	0	7
Lane Group Flow (vph)	32	53	0	0	250	0	0	406	0	0	74	630
Confl. Peds. (#/hr)			24			23			18			
Confl. Bikes (#/hr)			9			2			22			
Turn Type	Perm			Perm			Perm			Perm	Perm	
Protected Phases		4			8			2		6		6
Permitted Phases	4											
Actuated Green, G (s)	9.4	9.4			9.4			19.3			19.3	19.3
Effective Green, g (s)	10.3	10.3			10.3			20.2			20.2	20.2
Actuated g/C Ratio	0.27	0.27			0.27			0.52			0.52	0.52
Clearance Time (s)	4.9	4.9			4.9			4.9			4.9	4.9
Vehicle Extension (s)	2.0	2.0			2.0			3.5			3.5	3.5
Lane Grp Cap (vph)	273	478			459			1343			502	1833
v/s Ratio Prot		0.03										c0.18
v/s Ratio Perm	0.03				c0.15			0.16			0.08	
v/c Ratio	0.12	0.11			0.54			0.30			0.15	0.34
Uniform Delay, d1	10.7	10.6			12.1			5.2			4.7	5.3
Progression Factor	1.00	1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2	0.1	0.0			0.7			0.2			0.2	0.1
Delay (s)	10.7	10.7			12.8			5.3			4.9	5.4
Level of Service	B	B			B			A			A	A
Approach Delay (s)		10.7			12.8			5.3				5.4
Approach LOS		B			B			A				A
<b>Intersection Summary</b>												
HCM Average Control Delay			7.1									
HCM Volume to Capacity ratio			0.41									
Actuated Cycle Length (s)			38.5						8.0			
Intersection Capacity Utilization			65.5%									
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
 32: Robinson Ave & Park Blvd

10/17/2013

Movement	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frbp, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Volume (vph)	40
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	42
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	35
Confl. Bikes (#/hr)	8
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	



HCM Unsignalized Intersection Capacity Analysis

35: University Ave & Hawk St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations		↕			↕			↕			↕			
Sign Control		Free			Free			Stop			Stop			
Grade		0%			0%			0%			0%			
Volume (veh/h)	0	245	30	10	440	15	35	5	10	0	0	10		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		
Hourly flow rate (vph)	0	258	32	11	463	16	37	5	11	0	0	11		
Pedestrians														
Lane Width (ft)														
Walking Speed (ft/s)														
Percent Blockage														
Right turn flare (veh)														
Median type							None			None				
Median storage (veh)														
Upstream signal (ft)							324							
pX, platoon unblocked	0.84							0.84	0.84			0.84	0.84	0.84
vC, conflicting volume	479			289				776	774	274	779	782	471	
vC1, stage 1 conf vol														
vC2, stage 2 conf vol														
vCu, unblocked vol	377			289				733	730	274	736	739	368	
tC, single (s)	4.1			4.1				7.1	6.5	6.2	7.1	6.5	6.2	
tC, 2 stage (s)														
tF (s)	2.2			2.2				3.5	4.0	3.3	3.5	4.0	3.3	
p0 queue free %	100			99				87	98	99	100	100	98	
cM capacity (veh/h)	988			1272				275	290	765	271	286	567	
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>										
Volume Total	289	489	53	11										
Volume Left	0	11	37	0										
Volume Right	32	16	11	11										
cSH	988	1272	317	567										
Volume to Capacity	0.00	0.01	0.17	0.02										
Queue Length 95th (ft)	0	1	15	1										
Control Delay (s)	0.0	0.3	18.6	11.5										
Lane LOS		A	C	B										
Approach Delay (s)	0.0	0.3	18.6	11.5										
Approach LOS			C	B										
<b>Intersection Summary</b>														
Average Delay			1.5											
Intersection Capacity Utilization			48.3%		ICU Level of Service				A					
Analysis Period (min)			15											

HCM Signalized Intersection Capacity Analysis

40: University Ave & Goldfinch St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Fr <sub>t</sub>	1.00	0.97		1.00	0.96		1.00	0.92		1.00	0.99	
Fl <sub>t</sub> Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1810		1770	1796		1770	1709		1770	1853	
Fl <sub>t</sub> Permitted	0.32	1.00		0.61	1.00		0.66	1.00		0.59	1.00	
Satd. Flow (perm)	592	1810		1128	1796		1236	1709		1093	1853	
Volume (vph)	15	190	45	95	365	115	65	115	140	105	135	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	16	200	47	100	384	121	68	121	147	111	142	5
RTOR Reduction (vph)	0	21	0	0	28	0	0	88	0	0	3	0
Lane Group Flow (vph)	16	226	0	100	477	0	68	180	0	111	144	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.0	16.0		16.0	16.0		16.0	16.0		16.0	16.0	
Effective Green, g (s)	16.0	16.0		16.0	16.0		16.0	16.0		16.0	16.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.40		0.40	0.40	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	237	724		451	718		494	684		437	741	
v/s Ratio Prot		0.12			c0.27			c0.11			0.08	
v/s Ratio Perm	0.03			0.09			0.06			0.10		
v/c Ratio	0.07	0.31		0.22	0.66		0.14	0.26		0.25	0.19	
Uniform Delay, d <sub>1</sub>	7.4	8.2		7.9	9.8		7.6	8.0		8.0	7.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d <sub>2</sub>	0.5	1.1		1.1	4.8		0.6	0.9		1.4	0.6	
Delay (s)	7.9	9.4		9.0	14.6		8.2	9.0		9.4	8.4	
Level of Service	A	A		A	B		A	A		A	A	
Approach Delay (s)		9.3			13.7			8.8			8.8	
Approach LOS		A			B			A			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			10.9			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			40.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			63.3%			ICU Level of Service				B		
Analysis Period (min)			15									

c Critical Lane Group



HCM Unsignalized Intersection Capacity Analysis  
 169: University Ave & Front St

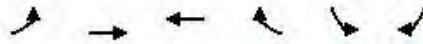
10/17/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖		↗
Sign Control	Free			Free		Stop
Grade	0%			0%		0%
Volume (veh/h)	440	85	45	500	55	35
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	463	89	47	526	58	37
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)	332					
pX, platoon unblocked	0.88					
vC, conflicting volume			553			508
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			553			508
tC, single (s)			4.1			6.2
tC, 2 stage (s)						
tF (s)			2.2			3.3
p0 queue free %			95			93
cM capacity (veh/h)			1017			565
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	553	574	95			
Volume Left	0	47	58			
Volume Right	89	0	37			
cSH	1700	1017	250			
Volume to Capacity	0.33	0.05	0.38			
Queue Length 95th (ft)	0	4	42			
Control Delay (s)	0.0	1.3	27.9			
Lane LOS			A			D
Approach Delay (s)	0.0	1.3	27.9			
Approach LOS			D			
<b>Intersection Summary</b>						
Average Delay			2.8			
Intersection Capacity Utilization			72.3%	ICU Level of Service	C	
Analysis Period (min)			15			



HCM Unsignalized Intersection Capacity Analysis  
 194: Washington St & Fifth Ave

10/17/2013



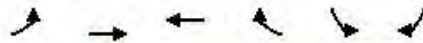
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↓			↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	0	1475	430	0	15
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	1553	453	0	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (ft)		248	112			
pX, platoon unblocked	0.78				0.78	0.78
vC, conflicting volume	2005				1779	1003
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2007				1718	726
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	95
cM capacity (veh/h)	220				63	287

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	0	0	1035	970	16
Volume Left	0	0	0	0	0
Volume Right	0	0	0	453	16
cSH	1700	1700	1700	1700	287
Volume to Capacity	0.00	0.00	0.61	0.57	0.05
Queue Length 95th (ft)	0	0	0	0	4
Control Delay (s)	0.0	0.0	0.0	0.0	18.3
Lane LOS					C
Approach Delay (s)	0.0		0.0		18.3
Approach LOS					C

Intersection Summary			
Average Delay		0.1	
Intersection Capacity Utilization		64.5%	ICU Level of Service C
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 194: Washington St & Fifth Ave

10/17/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	0	1475	430	0	15
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	1553	453	0	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)		248	112			
pX, platoon unblocked	0.78				0.78	0.78
vC, conflicting volume	2005				1779	1003
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2007				1718	726
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	95
cM capacity (veh/h)	220				63	287
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	0	0	1035	970	16	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	453	16	
cSH	1700	1700	1700	1700	287	
Volume to Capacity	0.00	0.00	0.61	0.57	0.05	
Queue Length 95th (ft)	0	0	0	0	4	
Control Delay (s)	0.0	0.0	0.0	0.0	18.3	
Lane LOS					C	
Approach Delay (s)	0.0		0.0		18.3	
Approach LOS					C	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			64.5%		ICU Level of Service	C
Analysis Period (min)			15			



HCM Signalized Intersection Capacity Analysis  
1: Washington St & First Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔		↔	↔		↔		↔		↔		↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0				
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00				
Frbp, ped/bikes	1.00	0.98		1.00	0.99			0.98				
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00				
Frt	1.00	0.99		1.00	0.98			0.95				
Flt Protected	0.95	1.00		0.95	1.00			0.99				
Satd. Flow (prot)	1770	3423		1770	3420			1707				
Flt Permitted	0.14	1.00		0.08	1.00			0.99				
Satd. Flow (perm)	253	3423		152	3420			1707				
Volume (vph)	125	1205	120	140	870	150	125	145	180	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	1268	126	147	916	158	132	153	189	0	0	0
RTOR Reduction (vph)	0	7	0	0	12	0	0	21	0	0	0	0
Lane Group Flow (vph)	132	1387	0	147	1062	0	0	453	0	0	0	0
Confl. Peds. (#/hr)			58			32			26			49
Confl. Bikes (#/hr)			19			7			4			6
Turn Type	pm+pt			pm+pt			Perm					
Protected Phases	5	2		1	6			4				
Permitted Phases	2			6			4					
Actuated Green, G (s)	56.7	48.3		56.3	48.1			36.5				
Effective Green, g (s)	58.0	49.2		57.6	49.0			37.4				
Actuated g/C Ratio	0.53	0.45		0.52	0.45			0.34				
Clearance Time (s)	4.4	4.9		4.4	4.9			4.9				
Vehicle Extension (s)	2.0	1.0		2.0	1.0			1.0				
Lane Grp Cap (vph)	255	1531		206	1523			580				
v/s Ratio Prot	0.04	c0.41		c0.06	0.31							
v/s Ratio Perm	0.23			0.32				0.27				
v/c Ratio	0.52	0.91		0.71	0.70			0.78				
Uniform Delay, d1	16.9	28.3		21.9	24.5			32.6				
Progression Factor	1.00	1.00		1.00	1.00			1.00				
Incremental Delay, d2	0.7	9.3		9.3	2.7			10.0				
Delay (s)	17.6	37.6		31.2	27.2			42.7				
Level of Service	B	D		C	C			D				
Approach Delay (s)		35.8			27.7			42.7			0.0	
Approach LOS		D			C			D			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			33.8			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			88.5%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
 3: Washington St & Fifth Ave

10/17/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↖↗	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	0.97	0.91
Frbp, ped/bikes	1.00			1.00	0.97	0.95
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	1.00			1.00	0.95	0.85
Flt Protected	1.00			1.00	0.97	1.00
Satd. Flow (prot)	3539			3539	3243	1369
Flt Permitted	1.00			1.00	0.97	1.00
Satd. Flow (perm)	3539			3539	3243	1369
Volume (vph)	1660	0	0	1065	445	465
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1747	0	0	1121	468	489
RTOR Reduction (vph)	0	0	0	0	14	14
Lane Group Flow (vph)	1747	0	0	1121	667	262
Confl. Peds. (#/hr)		52				31
Confl. Bikes (#/hr)		14				
Turn Type						Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	70.5			70.5	24.2	24.2
Effective Green, g (s)	71.4			71.4	24.6	24.6
Actuated g/C Ratio	0.69			0.69	0.24	0.24
Clearance Time (s)	4.9			4.9	4.4	4.4
Vehicle Extension (s)	1.0			1.0	1.0	1.0
Lane Grp Cap (vph)	2430			2430	767	324
v/s Ratio Prot	c0.49			0.32	c0.21	
v/s Ratio Perm						0.19
v/c Ratio	0.72			0.46	0.87	0.81
Uniform Delay, d1	10.1			7.5	38.2	37.5
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	1.9			0.6	10.0	13.1
Delay (s)	12.0			8.1	48.2	50.6
Level of Service	B			A	D	D
Approach Delay (s)	12.0			8.1	48.9	
Approach LOS	B			A	D	
<b>Intersection Summary</b>						
HCM Average Control Delay			20.1		HCM Level of Service	C
HCM Volume to Capacity ratio			0.76			
Actuated Cycle Length (s)			104.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			74.5%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis  
4: Washington St & Goldfinch St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↗		↖	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.94		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3532		1770	3474		1770	1759		1770	1830	
Flt Permitted	0.95	1.00		0.95	1.00		0.54	1.00		0.49	1.00	
Satd. Flow (perm)	1770	3532		1770	3474		1011	1759		910	1830	
Volume (vph)	245	710	10	145	765	60	65	135	80	250	165	15
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	258	747	11	153	805	63	68	142	84	263	174	16
RTOR Reduction (vph)	0	1	0	0	5	0	0	22	0	0	4	0
Lane Group Flow (vph)	258	757	0	153	863	0	68	204	0	263	186	0
Confl. Peds. (#/hr)							27					27
Confl. Bikes (#/hr)							3					16
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	17.9	46.8		13.3	41.8		31.0	31.0		30.1	30.1	
Effective Green, g (s)	18.3	47.7		13.3	42.7		31.0	31.0		31.0	31.0	
Actuated g/C Ratio	0.18	0.46		0.13	0.41		0.30	0.30		0.30	0.30	
Clearance Time (s)	4.4	4.9		4.0	4.9		4.0	4.0		4.9	4.9	
Vehicle Extension (s)	2.0	3.3		3.0	3.3		3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)	311	1620		226	1426		301	524		271	545	
v/s Ratio Prot	c0.15	0.21		0.09	c0.25			0.12			0.10	
v/s Ratio Perm							0.07			c0.29		
v/c Ratio	0.83	0.47		0.68	0.61		0.23	0.39		0.97	0.34	
Uniform Delay, d1	41.3	19.4		43.3	24.0		27.5	29.0		36.0	28.5	
Progression Factor	1.00	1.00		0.92	1.22		1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.8	1.0		6.9	1.7		0.4	0.5		46.2	0.1	
Delay (s)	57.1	20.4		46.7	31.1		27.9	29.5		82.2	28.7	
Level of Service	E	C		D	C		C	C		F	C	
Approach Delay (s)		29.7			33.4			29.1			59.8	
Approach LOS		C			C			C			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			35.9				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)		104.0					Sum of lost time (s)		12.0			
Intersection Capacity Utilization		76.0%					ICU Level of Service		D			
Analysis Period (min)		15										
c	Critical Lane Group											



HCM Signalized Intersection Capacity Analysis  
5: Washington St & Front St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑			↑↑			↑↓		↑	↑	↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	4.0	
Lane Util. Factor		0.95			0.95			1.00		0.95	0.95	1.00	
Frbp, ped/bikes		1.00			1.00			1.00		1.00	1.00	0.95	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	1.00	
Frt		1.00			1.00			0.91		1.00	1.00	0.85	
Flt Protected		1.00			1.00			0.98		0.95	0.95	1.00	
Satd. Flow (prot)		3532			3538			1664		1681	1681	1506	
Flt Permitted		1.00			0.95			0.93		0.75	0.75	1.00	
Satd. Flow (perm)		3532			3362			1568		1322	1322	1506	
Volume (vph)	0	1115	15	5	940	0	5	0	10	380	0	295	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	102%	100%	100%	
Adj. Flow (vph)	0	1174	16	5	989	0	5	0	11	408	0	311	
RTOR Reduction (vph)	0	1	0	0	0	0	0	8	0	0	0	56	
Lane Group Flow (vph)	0	1189	0	0	994	0	0	8	0	204	204	255	
Confl. Peds. (#/hr)								36				19	
Confl. Bikes (#/hr)								6				16	
Turn Type				Perm		Perm				Perm		Perm	
Protected Phases		2			6			8				4	
Permitted Phases				6			8			4		4	
Actuated Green, G (s)		70.9			70.9			24.2		23.3	23.3	23.3	
Effective Green, g (s)		71.8			71.8			24.2		24.2	24.2	24.2	
Actuated g/C Ratio		0.69			0.69			0.23		0.23	0.23	0.23	
Clearance Time (s)		4.9			4.9			4.0		4.9	4.9	4.9	
Vehicle Extension (s)		3.0			3.0			3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		2438			2321			365		308	308	350	
v/s Ratio Prot		c0.34											
v/s Ratio Perm					0.30			0.00		0.15	0.15	c0.17	
v/c Ratio		0.49			0.43			0.02		0.66	0.66	0.73	
Uniform Delay, d1		7.5			7.1			30.8		36.2	36.2	36.9	
Progression Factor		0.76			1.00			1.00		1.00	1.00	1.00	
Incremental Delay, d2		0.6			0.6			0.0		5.3	5.3	7.4	
Delay (s)		6.3			7.7			30.8		41.5	41.5	44.3	
Level of Service		A			A			C		D	D	D	
Approach Delay (s)		6.3			7.7			30.8			42.7		
Approach LOS		A			A			C			D		
<b>Intersection Summary</b>													
HCM Average Control Delay			15.9									HCM Level of Service	B
HCM Volume to Capacity ratio			0.55										
Actuated Cycle Length (s)			104.0									Sum of lost time (s)	8.0
Intersection Capacity Utilization			60.3%									ICU Level of Service	B
Analysis Period (min)			15										

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
7: Washington St & Fourth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0					4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		0.97	0.95					0.95	0.95	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99					1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00					1.00	1.00	1.00
Fr t	1.00	0.99		1.00	0.99					1.00	1.00	0.85
Fl t Protected	0.95	1.00		0.95	1.00					0.95	0.97	1.00
Satd. Flow (prot)	1770	3463		3433	3486					1681	1723	1537
Fl t Permitted	0.95	1.00		0.95	1.00					0.95	0.97	1.00
Satd. Flow (perm)	1770	3463		3433	3486					1681	1723	1537
Volume (vph)	70	1220	125	330	1035	65	0	0	0	675	205	160
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	1284	132	347	1089	68	0	0	0	711	216	168
RTOR Reduction (vph)	0	7	0	0	4	0	0	0	0	0	0	58
Lane Group Flow (vph)	74	1409	0	347	1153	0	0	0	0	451	476	110
Confl. Peds. (#/hr)			43			35						10
Confl. Bikes (#/hr)			10			10			1			10
Turn Type	Prot			Prot						Perm		Perm
Protected Phases	5	2		1	6						4	
Permitted Phases										4		4
Actuated Green, G (s)	7.6	48.2		11.7	52.3					29.9	29.9	29.9
Effective Green, g (s)	8.0	49.1		12.1	53.2					30.8	30.8	30.8
Actuated g/C Ratio	0.08	0.47		0.12	0.51					0.30	0.30	0.30
Clearance Time (s)	4.4	4.9		4.4	4.9					4.9	4.9	4.9
Vehicle Extension (s)	2.0	0.2		1.0	0.2					1.0	1.0	1.0
Lane Grp Cap (vph)	136	1635		399	1783					498	510	455
v/s Ratio Prot	0.04	0.41		0.10	0.33							
v/s Ratio Perm										0.27	0.28	0.07
v/c Ratio	0.54	0.86		0.87	0.65					0.91	0.93	0.24
Uniform Delay, d1	46.2	24.4		45.2	18.5					35.2	35.6	27.8
Progression Factor	1.00	1.00		1.13	1.00					1.00	1.00	1.00
Incremental Delay, d2	2.4	6.2		16.0	1.7					19.5	24.0	0.1
Delay (s)	48.6	30.7		67.1	20.1					54.7	59.6	27.9
Level of Service	D	C		E	C					D	E	C
Approach Delay (s)		31.5			31.0			0.0			52.7	
Approach LOS		C			C			A			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			37.0			HCM Level of Service					D	
HCM Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			104.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			82.0%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Washington St & SR-163 Off-Ramp

10/17/2013

	→	↘	←	↙	↖	↑	↗	↘	↓	↙	↗	↻
Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR	SWR	SWR2
Lane Configurations	↑↑		↑↑			↕			↕			↕
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0			4.0			4.0
Lane Util. Factor	0.95		0.95			1.00			1.00			1.00
Frpb, ped/bikes	0.99		1.00			1.00			1.00			1.00
Flpb, ped/bikes	1.00		1.00			1.00			1.00			1.00
Frt	0.99		1.00			0.95			0.98			0.86
Flt Protected	1.00		1.00			0.98			0.98			1.00
Satd. Flow (prot)	3467		3534			1726			1773			1611
Flt Permitted	1.00		1.00			0.83			0.83			1.00
Satd. Flow (perm)	3467		3534			1460			1502			1611
Volume (vph)	2290	235	560	5	60	15	45	15	10	5	590	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2411	247	589	5	63	16	47	16	11	5	621	5
RTOR Reduction (vph)	8	0	0	0	0	25	0	0	4	0	0	0
Lane Group Flow (vph)	2650	0	594	0	0	101	0	0	28	0	626	0
Confl. Peds. (#/hr)	18		1						7			
Turn Type					Perm		Perm				custom	
Protected Phases	2		6		8		8		4		5	
Permitted Phases					8		4					
Actuated Green, G (s)	38.5		38.5		11.7		11.7		11.2		36.3	
Effective Green, g (s)	39.5		39.5		11.7		11.7		11.7		36.8	
Actuated g/C Ratio	0.40		0.40		0.12		0.12		0.12		0.37	
Clearance Time (s)	5.0		5.0		4.0		4.5		4.5		4.5	
Vehicle Extension (s)	2.0		2.0		0.9		2.0		2.0		2.0	
Lane Grp Cap (vph)	1369		1396		171		176		593			
v/s Ratio Prot	c0.76		0.17						c0.39			
v/s Ratio Perm					c0.07		0.02					
v/c Ratio	1.94		0.43		0.59		0.16		1.06			
Uniform Delay, d1	30.2		22.0		41.9		39.7		31.6			
Progression Factor	1.00		1.00		1.00		1.00		1.00			
Incremental Delay, d2	423.8		1.0		3.6		0.2		52.5			
Delay (s)	454.1		23.0		45.5		39.9		84.1			
Level of Service	F		C		D		D		F			
Approach Delay (s)	454.1		23.0		45.5		39.9					
Approach LOS	F		C		D		D					
<b>Intersection Summary</b>												
HCM Average Control Delay	317.2		HCM Level of Service		F							
HCM Volume to Capacity ratio	1.39											
Actuated Cycle Length (s)	100.0		Sum of lost time (s)		12.0							
Intersection Capacity Utilization	86.6%		ICU Level of Service		E							
Analysis Period (min)	15											
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis

14: Normal St & Park Blvd

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1532	1770	3539	1529	1770	3539	1518	1770	3329	1441
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1532	1770	3539	1529	1770	3539	1518	1770	3329	1441
Volume (vph)	485	715	130	160	435	60	75	320	230	80	255	195
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	511	753	137	168	458	63	79	337	242	84	268	205
RTOR Reduction (vph)	0	0	90	0	0	44	0	0	0	0	8	125
Lane Group Flow (vph)	511	753	47	168	458	19	79	337	242	84	297	43
Confl. Peds. (#/hr)			5			16			38			
Confl. Bikes (#/hr)			25			16			1			
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Prot
Protected Phases	5	2		1	6		3	8		7	4	4
Permitted Phases			2			6			8			
Actuated Green, G (s)	17.2	31.7	31.7	12.9	26.9	26.9	6.7	24.6	24.6	5.2	23.1	23.1
Effective Green, g (s)	19.1	33.6	33.6	14.3	28.8	28.8	8.1	26.5	26.5	6.6	25.0	25.0
Actuated g/C Ratio	0.20	0.35	0.35	0.15	0.30	0.30	0.08	0.27	0.27	0.07	0.26	0.26
Clearance Time (s)	5.9	5.9	5.9	5.4	5.9	5.9	5.4	5.9	5.9	5.4	5.9	5.9
Vehicle Extension (s)	2.0	4.8	4.8	2.0	3.8	3.8	2.0	3.5	3.5	2.0	3.9	3.9
Lane Grp Cap (vph)	676	1226	531	261	1051	454	148	967	415	120	858	371
v/s Ratio Prot	c0.15	c0.21		0.09	0.13		0.04	0.10		c0.05	0.09	0.03
v/s Ratio Perm			0.03			0.01			c0.16			
v/c Ratio	0.76	0.61	0.09	0.64	0.44	0.04	0.53	0.35	0.58	0.70	0.35	0.12
Uniform Delay, d1	36.8	26.3	21.4	39.0	27.5	24.3	42.6	28.3	30.5	44.2	29.3	27.6
Progression 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
Incremental Delay, d2	4.3	1.3	0.1	4.0	0.4	0.0	1.8	0.3	2.2	13.4	0.3	0.2
Delay (s)	41.0	27.6	21.5	43.0	27.9	24.3	44.5	28.6	32.7	57.7	29.7	27.7
Level of Service	D	C	C	D	C	C	D	C	C	E	C	C
Approach Delay (s)		31.9			31.3			32.0			33.3	
Approach LOS		C			C			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			32.0			HCM Level of Service		C				
HCM Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			97.0			Sum of lost time (s)		8.0				
Intersection Capacity Utilization			78.4%			ICU Level of Service		D				
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
15: University Ave & First Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frbp, ped/bikes		0.98			0.98			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.98			0.98			0.99	
Flt Protected		1.00			1.00			0.99			0.99	
Satd. Flow (prot)		1760			1782			1767			1806	
Flt Permitted		0.96			0.93			0.82			0.87	
Satd. Flow (perm)		1691			1656			1473			1589	
Volume (vph)	30	405	140	50	460	100	165	310	105	45	190	25
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	426	147	53	484	105	174	326	111	47	200	26
RTOR Reduction (vph)	0	23	0	0	13	0	0	16	0	0	8	0
Lane Group Flow (vph)	0	583	0	0	629	0	0	595	0	0	266	0
Confl. Peds. (#/hr)			37				52			34		51
Confl. Bikes (#/hr)			7				6			5		4
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		21.1			21.1			21.1			21.1	
Effective Green, g (s)		22.0			22.0			22.0			22.0	
Actuated g/C Ratio		0.42			0.42			0.42			0.42	
Clearance Time (s)		4.9			4.9			4.9			4.9	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		715			701			623			672	
v/s Ratio Prot												
v/s Ratio Perm		0.34			c0.38			c0.40			0.17	
v/c Ratio		0.81			0.90			0.96			0.40	
Uniform Delay, d1		13.2			13.9			14.5			10.4	
Progression Factor		1.00			1.02			1.00			1.00	
Incremental Delay, d2		9.9			15.4			25.1			0.1	
Delay (s)		23.1			29.6			39.6			10.5	
Level of Service		C			C			D			B	
Approach Delay (s)		23.1			29.6			39.6			10.5	
Approach LOS		C			C			D			B	
<b>Intersection Summary</b>												
HCM Average Control Delay		28.2			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.93										
Actuated Cycle Length (s)		52.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		105.1%			ICU Level of Service			G				
Analysis Period (min)		15										
c	Critical Lane Group											



HCM Signalized Intersection Capacity Analysis  
16: University Ave & Fourth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔						↔↔	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0						4.0	
Lane Util. Factor		1.00		1.00	1.00						0.95	
Frpb, ped/bikes		0.98		1.00	1.00						0.99	
Flpb, ped/bikes		1.00		1.00	1.00						1.00	
Frt		0.97		1.00	1.00						0.99	
Flt Protected		1.00		0.95	1.00						0.99	
Satd. Flow (prot)		1784		1770	1863						3426	
Flt Permitted		1.00		0.30	1.00						0.99	
Satd. Flow (perm)		1784		553	1863						3426	
Volume (vph)	0	390	90	245	525	0	0	0	0	120	420	40
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	411	95	258	553	0	0	0	0	126	442	42
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	499	0	258	553	0	0	0	0	0	605	0
Confl. Peds. (#/hr)			47			49				21		55
Confl. Bikes (#/hr)			3			1						3
Turn Type				pm+pt							Perm	
Protected Phases		2		1	6							4
Permitted Phases				6						4		
Actuated Green, G (s)		50.0		67.9	67.9						22.5	
Effective Green, g (s)		50.9		68.8	68.8						23.4	
Actuated g/C Ratio		0.49		0.66	0.66						0.22	
Clearance Time (s)		4.9		4.4	4.9						4.9	
Vehicle Extension (s)		2.0		3.0	2.0						2.0	
Lane Grp Cap (vph)		873		528	1232						771	
v/s Ratio Prot		c0.28		c0.07	0.30							
v/s Ratio Perm				0.26							0.18	
v/c Ratio		0.57		0.49	0.45						0.78	
Uniform Delay, d1		18.8		9.9	8.5						37.9	
Progression Factor		0.89		2.45	1.06						1.00	
Incremental Delay, d2		1.5		0.6	0.1						4.8	
Delay (s)		18.3		24.9	9.1						42.8	
Level of Service		B		C	A						D	
Approach Delay (s)		18.3			14.1			0.0			42.8	
Approach LOS		B			B			A			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			24.3			HCM Level of Service					C	
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			104.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			70.2%			ICU Level of Service					C	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
17: University Ave & Fifth Ave

10/17/2013

	↖	→	↗	↖	←	↖	↗	↑	↖	↗	↓	↖
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖			↖↖	↖		↖↖↖				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0				
Lane Util. Factor		1.00			0.95	1.00		0.91				
Frbp, ped/bikes		1.00			1.00	0.74		0.95				
Flpb, ped/bikes		1.00			1.00	1.00		1.00				
Frt		1.00			1.00	0.85		0.95				
Flt Protected		0.99			1.00	1.00		0.99				
Satd. Flow (prot)		1853			3539	1170		4555				
Flt Permitted		0.84			1.00	1.00		0.99				
Satd. Flow (perm)		1565			3539	1170		4555				
Volume (vph)	70	605	0	0	795	310	130	590	370	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	637	0	0	837	326	137	621	389	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	73	0	89	0	0	0	0
Lane Group Flow (vph)	0	711	0	0	837	253	0	1058	0	0	0	0
Confl. Peds. (#/hr)			134			136			97			91
Confl. Bikes (#/hr)			8			20			4			24
Turn Type	Perm			Perm			Perm					
Protected Phases		2			2			4				
Permitted Phases	2					2	4					
Actuated Green, G (s)		59.5			59.5	59.5		27.1				
Effective Green, g (s)		60.4			60.4	60.4		28.0				
Actuated g/C Ratio		0.58			0.58	0.58		0.27				
Clearance Time (s)		4.9			4.9	4.9		4.9				
Vehicle Extension (s)		1.0			1.0	1.0		1.0				
Lane Grp Cap (vph)		909			2055	680		1226				
v/s Ratio Prot					0.24							
v/s Ratio Perm		0.45				0.22		0.23				
v/c Ratio		0.78			0.41	0.37		0.86				
Uniform Delay, d1		16.7			12.0	11.7		36.2				
Progression Factor		0.87			1.42	1.84		1.00				
Incremental Delay, d2		6.0			0.5	1.3		6.3				
Delay (s)		20.6			17.5	22.7		42.4				
Level of Service		C			B	C		D				
Approach Delay (s)		20.6			19.0			42.4			0.0	
Approach LOS		C			B			D			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			28.3				HCM Level of Service		C			
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			104.0				Sum of lost time (s)		8.0			
Intersection Capacity Utilization			96.1%				ICU Level of Service		F			
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
18: University Ave & Sixth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔↔		↔	↔↔	↔	↔	↔↔		↔	↔↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	1.00	0.90	1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3406		1770	3539	1424	1770	3469		1770	3539	1521
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	3406		1770	3539	1424	1770	3469		1770	3539	1521
Volume (vph)	385	450	55	175	540	236	50	985	120	340	820	490
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	405	474	58	184	568	247	53	1037	126	358	863	516
RTOR Reduction (vph)	0	9	0	0	0	4	0	9	0	0	0	70
Lane Group Flow (vph)	405	523	0	184	568	243	53	1154	0	358	863	446
Confl. Peds. (#/hr)			115			121			16			34
Confl. Bikes (#/hr)			29			26			4			6
Turn Type	Prot			Prot	pm+ov		Prot			Prot		pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases						6						4
Actuated Green, G (s)	9.6	25.9		12.9	29.2	44.8	6.1	30.5		15.6	40.0	49.6
Effective Green, g (s)	10.0	26.8		13.3	30.1	46.1	6.5	31.9		16.0	41.4	51.4
Actuated g/C Ratio	0.10	0.26		0.13	0.29	0.44	0.06	0.31		0.15	0.40	0.49
Clearance Time (s)	4.4	4.9		4.4	4.9	4.4	4.4	5.4		4.4	5.4	4.4
Vehicle Extension (s)	3.0	2.2		2.0	2.2	2.0	2.0	3.8		2.0	3.8	3.0
Lane Grp Cap (vph)	330	878		226	1024	686	111	1064		272	1409	810
v/s Ratio Prot	c0.12	0.15		0.10	c0.16	0.05	0.03	c0.33		c0.20	0.24	0.05
v/s Ratio Perm						0.12						0.24
y/c Ratio	1.23	0.60		0.81	0.55	0.35	0.48	1.08		1.32	0.61	0.55
Uniform Delay, d1	47.0	33.8		44.1	31.3	19.1	47.1	36.0		44.0	24.9	18.3
Progression Factor	0.95	1.12		1.11	1.12	0.90	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	116.7	1.7		17.9	2.1	0.1	1.2	53.5		165.9	0.9	0.8
Delay (s)	161.5	39.5		66.8	37.1	17.2	48.3	89.5		209.9	25.8	19.1
Level of Service	F	D		E	D	B	D	F		F	C	B
Approach Delay (s)		92.2			37.7			87.7			61.8	
Approach LOS		F			D			F			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			69.1	HCM Level of Service				E				
HCM Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			104.0	Sum of lost time (s)				16.0				
Intersection Capacity Utilization			97.7%	ICU Level of Service				F				
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
19: University Ave & Seventh Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕			↕			↕↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frbp, ped/bikes		0.97			0.99			0.97			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.93			0.95	
Fli Protected		1.00			1.00			0.98			0.98	
Satd. Flow (prot)		3365			3462			1655			1714	
Flt Permitted		0.88			0.78			0.79			0.68	
Satd. Flow (perm)		2952			2721			1329			1195	
Volume (vph)	45	850	85	60	675	30	65	30	95	50	25	50
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	47	895	89	63	711	32	68	32	100	53	26	53
RTOR Reduction (vph)	0	4	0	0	2	0	0	45	0	0	30	0
Lane Group Flow (vph)	0	1027	0	0	804	0	0	155	0	0	102	0
Confl. Peds. (#/hr)			116				87			35		
Confl. Bikes (#/hr)			35				22			3		
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		78.6			78.6			15.6			15.6	
Effective Green, g (s)		79.5			79.5			16.5			16.5	
Actuated g/C Ratio		0.76			0.76			0.16			0.16	
Clearance Time (s)		4.9			4.9			4.9			4.9	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		2257			2080			211			190	
v/s Ratio Prot												
v/s Ratio Perm		c0.35			0.30			c0.12			0.09	
v/c Ratio		0.46			0.39			0.73			0.54	
Uniform Delay, d1		4.4			4.1			41.6			40.2	
Progression Factor		0.35			0.14			1.00			1.00	
Incremental Delay, d2		0.3			0.3			10.7			1.5	
Delay (s)		1.9			0.9			52.4			41.7	
Level of Service		A			A			D			D	
Approach Delay (s)		1.9			0.9			52.4			41.7	
Approach LOS		A			A			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay		8.6			HCM Level of Service			A				
HCM Volume to Capacity ratio		0.50										
Actuated Cycle Length (s)		104.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		77.5%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis

20: University Ave & Eighth St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frbp, ped/bikes		0.99			1.00			0.93			0.96	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.98			0.98			0.93			0.96	
Flt Protected		1.00			1.00			0.98			0.97	
Satd. Flow (prot)		3429			3475			1575			1661	
Flt Permitted		0.90			0.70			0.83			0.72	
Satd. Flow (perm)		3088			2446			1341			1231	
Volume (vph)	30	1005	125	60	795	95	55	0	65	145	0	65
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	1058	132	63	837	100	58	0	68	153	0	68
RTOR Reduction (vph)	0	8	0	0	7	0	0	43	0	0	15	0
Lane Group Flow (vph)	0	1214	0	0	993	0	0	83	0	0	206	0
Confl. Peds. (#/hr)			38						70			65
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			3			4	
Permitted Phases	2			2			3			4		
Actuated Green, G (s)		54.3			54.3			13.8			18.2	
Effective Green, g (s)		56.2			56.2			15.7			20.1	
Actuated g/C Ratio		0.54			0.54			0.15			0.19	
Clearance Time (s)		5.9			5.9			5.9			5.9	
Vehicle Extension (s)		1.0			1.0			2.0			2.0	
Lane Grp Cap (vph)		1669			1322			202			238	
v/s Ratio Prot												
v/s Ratio Perm		0.39			c0.41			c0.06			c0.17	
v/c Ratio		0.73			0.75			0.41			0.86	
Uniform Delay, d1		18.1			18.5			40.0			40.6	
Progression Factor		0.98			0.82			1.00			1.00	
Incremental Delay, d2		2.6			3.8			0.5			25.4	
Delay (s)		20.3			19.0			40.4			66.0	
Level of Service		C			B			D			E	
Approach Delay (s)		20.3			19.0			40.4			66.0	
Approach LOS		C			B			D			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			24.7									HCM Level of Service C
HCM Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			104.0									Sum of lost time (s) 12.0
Intersection Capacity Utilization			89.6%									ICU Level of Service E
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
21: University Ave & Ninth St

10/17/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕		↗	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		0.95	0.95		1.00	1.00
Frbp, ped/bikes		1.00	0.99		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3536	3501		1770	1536
Flt Permitted		0.93	1.00		0.95	1.00
Satd. Flow (perm)		3284	3501		1770	1536
Volume (vph)	20	975	780	20	355	145
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	1026	821	21	374	153
RTOR Reduction (vph)	0	0	1	0	0	56
Lane Group Flow (vph)	0	1047	841	0	374	97
Confl. Peds. (#/hr)				94		10
Confl. Bikes (#/hr)				23		3
Turn Type	Perm				Perm	
Protected Phases		2	6		4	
Permitted Phases	2					4
Actuated Green, G (s)		69.2	69.2		25.5	25.5
Effective Green, g (s)		70.1	70.1		25.9	25.9
Actuated g/C Ratio		0.67	0.67		0.25	0.25
Clearance Time (s)		4.9	4.9		4.4	4.4
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	2214	2360			441	383
v/s Ratio Prot			0.24		0.21	
v/s Ratio Perm		0.32				0.06
v/c Ratio		0.47	0.36		0.85	0.25
Uniform Delay, d1		8.1	7.3		37.2	31.3
Progression Factor		0.23	0.38		1.00	1.00
Incremental Delay, d2		0.5	0.1		14.1	0.3
Delay (s)		2.3	2.8		51.2	31.6
Level of Service		A	A		D	C
Approach Delay (s)		2.3	2.8		45.5	
Approach LOS		A	A		D	
<b>Intersection Summary</b>						
HCM Average Control Delay		11.9			HCM Level of Service	B
HCM Volume to Capacity ratio		0.57				
Actuated Cycle Length (s)		104.0			Sum of lost time (s)	8.0
Intersection Capacity Utilization		67.5%			ICU Level of Service	C
Analysis Period (min)		15				
c	Critical Lane Group					



HCM Signalized Intersection Capacity Analysis

22: University Ave & Tenth St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.97		1.00	1.00	0.66	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.93		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	3341		1770	3539	1051	1770	1694		1770	1713	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.46	1.00		0.61	1.00	
Satd. Flow (perm)	1787	3341		1770	3539	1051	855	1694		1145	1713	
Volume (vph)	150	940	185	115	615	25	95	60	50	30	95	75
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	158	989	195	121	647	26	100	63	53	32	100	79
RTOR Reduction (vph)	0	12	0	0	0	9	0	34	0	0	31	0
Lane Group Flow (vph)	158	1172	0	121	647	17	100	82	0	32	148	0
Confl. Peds. (#/hr)			69			102			35			19
Confl. Bikes (#/hr)			30			24			2			1
Heavy Vehicles (%)	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot			Prot		Perm	Perm			Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases						6	8			4		
Actuated Green, G (s)	13.0	61.1		10.8	58.9	58.9	17.9	17.9		17.9	17.9	
Effective Green, g (s)	13.4	62.0		11.2	59.8	59.8	18.8	18.8		18.8	18.8	
Actuated g/C Ratio	0.13	0.60		0.11	0.57	0.57	0.18	0.18		0.18	0.18	
Clearance Time (s)	4.4	4.9		4.4	4.9	4.9	4.9	4.9		4.9	4.9	
Vehicle Extension (s)	2.0	5.3		2.0	3.4	3.4	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	230	1992		191	2035	604	155	306		207	310	
v/s Ratio Prot	c0.09	c0.35		0.07	0.18			0.05			0.09	
v/s Ratio Perm						0.02	c0.12			0.03		
v/c Ratio	0.69	0.59		0.63	0.32	0.03	0.65	0.27		0.15	0.48	
Uniform Delay, d1	43.3	13.1		44.4	11.5	9.5	39.5	36.7		35.9	38.2	
Progression Factor	1.03	0.98		1.39	0.30	0.06	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.5	1.1		4.7	0.4	0.1	6.7	0.2		0.1	0.4	
Delay (s)	50.2	13.8		66.6	3.8	0.7	46.2	36.9		36.0	38.6	
Level of Service	D	B		E	A	A	D	D		D	D	
Approach Delay (s)		18.1			13.3			41.2			38.2	
Approach LOS		B			B			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			20.2			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			104.0			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			77.2%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
23: University Ave & Vermont St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.76	1.00	0.98		1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1593	3147		1593	3185	1089	1593	1546		1593	1676	1325
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.63	1.00		0.68	1.00	1.00
Satd. Flow (perm)	1593	3147		1593	3185	1089	1055	1546		1144	1676	1325
Volume (vph)	80	880	35	45	620	85	10	55	35	100	115	130
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	926	37	47	653	89	11	58	37	105	121	137
RTOR Reduction (vph)	0	2	0	0	0	39	0	26	0	0	0	105
Lane Group Flow (vph)	84	961	0	47	653	50	11	69	0	105	121	32
Confl. Peds. (#/hr)			46			86			34			56
Confl. Bikes (#/hr)			27			14			11			3
Turn Type	Prot			Prot		Perm	Perm			Perm		Perm
Protected Phases	5	2		1	6			8				4
Permitted Phases						6	8			4		4
Actuated Green, G (s)	8.8	60.0		6.7	57.9	57.9	23.1	23.1		23.1	23.1	23.1
Effective Green, g (s)	9.2	60.9		7.1	58.8	58.8	24.0	24.0		24.0	24.0	24.0
Actuated g/C Ratio	0.09	0.59		0.07	0.57	0.57	0.23	0.23		0.23	0.23	0.23
Clearance Time (s)	4.4	4.9		4.4	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)	2.0	3.2		2.0	3.4	3.4	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	141	1843		109	1801	616	243	357		264	387	306
v/s Ratio Prot	c0.05	c0.31		0.03	0.21			0.04				0.07
v/s Ratio Perm						0.05	0.01			c0.09		0.02
v/c Ratio	0.60	0.52		0.43	0.36	0.08	0.05	0.19		0.40	0.31	0.10
Uniform Delay, d1	45.6	12.9		46.5	12.4	10.3	31.1	32.2		33.9	33.2	31.5
Progression Factor	0.99	1.08		1.17	0.52	0.14	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.7	0.9		1.0	0.5	0.2	0.1	0.3		1.0	0.5	0.1
Delay (s)	48.9	14.8		55.2	7.0	1.7	31.2	32.5		34.9	33.6	31.7
Level of Service	D	B		E	A	A	C	C		C	C	C
Approach Delay (s)		17.5			9.3			32.3			33.2	
Approach LOS		B			A			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			17.8									HCM Level of Service B
HCM Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			104.0									Sum of lost time (s) 8.0
Intersection Capacity Utilization			65.6%									ICU Level of Service C
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
24: University Ave & Richmond St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖ ↗		↖ ↗		↖ ↗		↖ ↗		↖ ↗		↖ ↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.97		1.00	1.00	0.80	1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frnt	1.00	0.99		1.00	1.00	0.85	1.00	0.94		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3397		1770	3539	1266	1770	1704		1770	1749	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.40	1.00		0.59	1.00	
Satd. Flow (perm)	1770	3397		1770	3539	1266	737	1704		1095	1749	
Volume (vph)	150	805	70	65	565	80	45	85	65	90	185	80
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	158	847	74	68	595	84	47	89	68	95	195	84
RTOR Reduction (vph)	0	5	0	0	0	45	0	32	0	0	18	0
Lane Group Flow (vph)	158	916	0	68	595	39	47	125	0	95	261	0
Confl. Peds. (#/hr)			127			69			43			52
Confl. Bikes (#/hr)			26			20			6			3
Turn Type	Prot		Prot		Perm		Perm		Perm			
Protected Phases	5	2		1	6			8				4
Permitted Phases						6	8			4		
Actuated Green, G (s)	13.5	54.0		7.2	47.7	47.7	28.6	28.6		28.6	28.6	
Effective Green, g (s)	13.9	54.9		7.6	48.6	48.6	29.5	29.5		29.5	29.5	
Actuated g/C Ratio	0.13	0.53		0.07	0.47	0.47	0.28	0.28		0.28	0.28	
Clearance Time (s)	4.4	4.9		4.4	4.9	4.9	4.9	4.9		4.9	4.9	
Vehicle Extension (s)	2.0	3.2		2.0	3.1	3.1	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	237	1793		129	1654	592	209	483		311	496	
v/s Ratio Prot	c0.09	c0.27		0.04	0.17			0.07			c0.15	
v/s Ratio Perm						0.03	0.06			0.09		
v/c Ratio	0.67	0.51		0.53	0.36	0.07	0.22	0.26		0.31	0.53	
Uniform Delay, d1	42.8	15.9		46.5	17.7	15.2	28.5	28.8		29.2	31.4	
Progression Factor	1.17	0.91		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	0.9		1.8	0.6	0.2	0.2	0.1		0.2	0.5	
Delay (s)	55.1	15.4		48.3	18.3	15.4	28.7	28.9		29.4	31.8	
Level of Service	E	B		D	B	B	C	C		C	C	
Approach Delay (s)		21.2			20.7			28.9			31.2	
Approach LOS		C			C			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay	23.3			HCM Level of Service				C				
HCM Volume to Capacity ratio	0.53											
Actuated Cycle Length (s)	104.0			Sum of lost time (s)				8.0				
Intersection Capacity Utilization	77.3%			ICU Level of Service				D				
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
25: University Ave & Normal St

10/17/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↖↗	↖↗		↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00		1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	3496		1770	1492
Flt Permitted	0.35	1.00	1.00		0.95	1.00
Satd. Flow (perm)	658	3539	3496		1770	1492
Volume (vph)	125	915	625	40	165	90
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	963	658	42	174	95
RTOR Reduction (vph)	0	0	4	0	0	67
Lane Group Flow (vph)	132	963	696	0	174	28
Confl. Peds. (#/hr)				58		75
Confl. Bikes (#/hr)				20		1
Turn Type	Perm				Perm	
Protected Phases		2	6		4	
Permitted Phases	2					4
Actuated Green, G (s)	42.4	42.4	42.4		21.3	21.3
Effective Green, g (s)	43.3	43.3	43.3		21.7	21.7
Actuated g/C Ratio	0.59	0.59	0.59		0.30	0.30
Clearance Time (s)	4.9	4.9	4.9		4.4	4.4
Vehicle Extension (s)	4.8	4.8	3.9		2.0	2.0
Lane Grp Cap (vph)	390	2099	2074		526	444
v/s Ratio Prot		c0.27	0.20		c0.10	
v/s Ratio Perm	0.20					0.02
v/c Ratio	0.34	0.46	0.34		0.33	0.06
Uniform Delay, d1	7.6	8.3	7.5		20.0	18.4
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.0	0.3	0.1		0.1	0.0
Delay (s)	8.6	8.6	7.7		20.1	18.4
Level of Service	A	A	A		C	B
Approach Delay (s)		8.6	7.7		19.5	
Approach LOS		A	A		B	
<b>Intersection Summary</b>						
HCM Average Control Delay			9.7		HCM Level of Service	A
HCM Volume to Capacity ratio			0.42			
Actuated Cycle Length (s)			73.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			75.7%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						



HCM Signalized Intersection Capacity Analysis

26: University Ave & Park Blvd

10/17/2013



















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖↗		↖	↖↗	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.98		1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3408		1770	3428		1770	3332		1770	3539	1469
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3408		1770	3428		1770	3332		1770	3539	1469
Volume (vph)	125	595	125	85	440	85	130	405	175	180	350	80
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	626	132	89	463	89	137	426	184	189	368	84
RTOR Reduction (vph)	0	18	0	0	16	0	0	49	0	0	0	59
Lane Group Flow (vph)	132	740	0	89	536	0	137	561	0	189	368	25
Confl. Peds. (#/hr)			68			42			43			60
Confl. Bikes (#/hr)			8			8			8			8
Turn Type	Prot			Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												4
Actuated Green, G (s)	5.0	25.5		6.4	26.9		9.5	26.3		7.2	24.0	24.0
Effective Green, g (s)	5.4	26.4		6.8	27.8		9.9	27.2		7.6	24.9	24.9
Actuated g/C Ratio	0.06	0.31		0.08	0.33		0.12	0.32		0.09	0.30	0.30
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	4.9		4.4	4.9	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	3.3		2.0	2.9	2.9
Lane Grp Cap (vph)	114	1071		143	1135		209	1079		160	1049	435
v/s Ratio Prot	c0.07	c0.22		0.05	0.16		0.08	c0.17		c0.11	0.10	
v/s Ratio Perm												0.02
v/c Ratio	1.16	0.69		0.62	0.47		0.66	0.52		1.18	0.35	0.06
Uniform Delay, d1	39.3	25.2		37.4	22.3		35.4	23.1		38.2	23.2	21.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	132.9	1.6		8.2	0.1		7.2	0.5		128.2	0.2	0.1
Delay (s)	172.2	26.8		45.5	22.4		42.6	23.6		166.4	23.4	21.2
Level of Service	F	C		D	C		D	C		F	C	C
Approach Delay (s)		48.4			25.6			27.1			65.3	
Approach LOS		D			C			C			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			41.6									D
HCM Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			84.0						12.0			
Intersection Capacity Utilization			85.0%									E
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis

27: Washington St & SR-163 On-Ramp

10/17/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0			4.0			
Lane Util. Factor	1.00	0.91	1.00		0.91	0.91			1.00			
Flpb, ped/bikes	1.00	1.00	0.98		0.99	0.99			1.00			
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00			1.00			
Frt	1.00	1.00	0.85		0.93	0.85			0.86			
Flt Protected	0.95	1.00	1.00		1.00	1.00			1.00			
Satd. Flow (prot)	1770	5085	1544		3133	1422			1603			
Flt Permitted	0.95	1.00	1.00		1.00	1.00			1.00			
Satd. Flow (perm)	1770	5085	1544		3133	1422			1603			
Volume (vph)	780	2260	525	0	470	830	0	0	25	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	821	2379	553	0	495	874	0	0	26	0	0	0
RTOR Reduction (vph)	0	0	0	0	91	91	0	0	0	0	0	0
Lane Group Flow (vph)	821	2379	553	0	841	346	0	0	26	0	0	0
Confl. Peds. (#/hr)			1									1
Confl. Bikes (#/hr)			11			2						
Turn Type	Prot		Perm			Perm			custom			
Protected Phases	5	2			6							
Permitted Phases			2			6			2			
Actuated Green, G (s)	55.7	116.0	116.0		51.0	51.0			116.0			
Effective Green, g (s)	56.1	116.0	116.0		51.9	51.9			116.0			
Actuated g/C Ratio	0.48	1.00	1.00		0.45	0.45			1.00			
Clearance Time (s)	4.4	2.0	2.0		4.9	4.9			2.0			
Vehicle Extension (s)	2.0	3.0	3.0		2.8	2.8			3.0			
Lane Grp Cap (vph)	856	5085	1544		1402	636			1603			
v/s Ratio Prot	c0.46	0.47			c0.27							
v/s Ratio Perm			0.36			0.24			0.02			
v/c Ratio	0.96	0.47	0.36		0.60	0.54			0.02			
Uniform Delay, d1	28.8	0.0	0.0		24.2	23.4			0.0			
Progression Factor	1.00	1.00	1.00		1.00	1.00			1.00			
Incremental Delay, d2	21.0	0.3	0.6		1.9	3.3			0.0			
Delay (s)	49.8	0.3	0.6		26.1	26.7			0.0			
Level of Service	D	A	A		C	C			A			
Approach Delay (s)		11.2			26.3			0.0			0.0	
Approach LOS		B			C			A			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			15.2				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			116.0				Sum of lost time (s)				8.0	
Intersection Capacity Utilization			84.1%				ICU Level of Service				E	
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis

28: Washington St & Lincoln Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗↘			↗↘		↘	↗			↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	0.91			0.91		1.00	1.00			1.00	1.00
Frbp, ped/bikes	1.00	0.99			1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.97			1.00		1.00	0.99			1.00	0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1770	4918			5081		1770	1829			1850	1583
Flt Permitted	0.95	1.00			1.00		0.95	1.00			0.99	1.00
Satd. Flow (perm)	1770	4918			5081		1770	1829			1850	1583
Volume (vph)	250	1715	355	0	955	5	345	45	5	5	30	145
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	263	1805	374	0	1005	5	363	47	5	5	32	153
RTOR Reduction (vph)	0	15	0	0	0	0	0	2	0	0	0	145
Lane Group Flow (vph)	263	2164	0	0	1010	0	363	50	0	0	37	8
Confl. Peds. (#/hr)			6			4			19			
Confl. Bikes (#/hr)			7			3						1
Turn Type	Prot						Split			Split		Prot
Protected Phases	5	2			6		3	3		4	4	4
Permitted Phases												
Actuated Green, G (s)	27.1	88.7			57.1		29.6	29.6			7.0	7.0
Effective Green, g (s)	27.5	89.6			58.1		30.5	30.5			7.9	7.9
Actuated g/C Ratio	0.17	0.56			0.36		0.19	0.19			0.05	0.05
Clearance Time (s)	4.4	4.9			5.0		4.9	4.9			4.9	4.9
Vehicle Extension (s)	2.0	5.7			6.0		3.0	3.0			2.0	2.0
Lane Grp Cap (vph)	304	2754			1845		337	349			91	78
v/s Ratio Prot	c0.15	c0.44			0.20		c0.21	0.03			c0.02	0.00
v/s Ratio Perm												
v/c Ratio	0.87	0.79			0.55		1.08	0.14			0.41	0.10
Uniform Delay, d1	64.4	27.7			40.5		64.8	53.9			73.8	72.6
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	21.1	2.3			0.8		71.1	0.2			1.1	0.2
Delay (s)	85.5	30.0			41.3		135.9	54.1			74.9	72.8
Level of Service	F	C			D		F	D			E	E
Approach Delay (s)		36.0			41.3			125.6			73.2	
Approach LOS		D			D			F			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			48.2				HCM Level of Service				D	
HCM Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			160.0						32.0			
Intersection Capacity Utilization			73.6%									D
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

HCM Signalized Intersection Capacity Analysis

32: Robinson Ave & Park Blvd

10/17/2013



Movement	SBL2	SBL	SBT	SBR
Lane Configurations		↔	↔	
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	
Lane Util. Factor		1.00	0.95	
Frpb, ped/bikes		1.00	0.99	
Flpb, ped/bikes		1.00	1.00	
Frt		1.00	0.98	
Flt Protected		0.95	1.00	
Satd. Flow (prot)		1770	3431	
Flt Permitted		0.30	1.00	
Satd. Flow (perm)		554	3431	
Volume (vph)	30	35	360	65
Peak-hour factor, PHF	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	37	379	68
RTOR Reduction (vph)	0	0	20	0
Lane Group Flow (vph)	0	69	427	0
Confl. Peds. (#/hr)				35
Confl. Bikes (#/hr)				8
Turn Type	Perm	Perm		
Protected Phases			6	
Permitted Phases	6	6		
Actuated Green, G (s)		20.8	20.8	
Effective Green, g (s)		21.7	21.7	
Actuated g/C Ratio		0.51	0.51	
Clearance Time (s)		4.9	4.9	
Vehicle Extension (s)		3.5	3.5	
Lane Grp Cap (vph)		284	1756	
v/s Ratio Prot			0.12	
v/s Ratio Perm		0.12		
v/c Ratio		0.24	0.24	
Uniform Delay, d1		5.8	5.8	
Progression Factor		1.00	1.00	
Incremental Delay, d2		0.5	0.1	
Delay (s)		6.3	5.9	
Level of Service		A	A	
Approach Delay (s)			5.9	
Approach LOS			A	
<b>Intersection Summary</b>				



HCM Signalized Intersection Capacity Analysis

40: University Ave & Goldfinch St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.93		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1820		1770	1803		1770	1729		1770	1843	
Flt Permitted	0.39	1.00		0.27	1.00		0.66	1.00		0.60	1.00	
Satd. Flow (perm)	719	1820		500	1803		1223	1729		1122	1843	
Volume (vph)	15	445	80	180	330	90	55	125	115	75	140	10
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	16	468	84	189	347	95	58	132	121	79	147	11
RTOR Reduction (vph)	0	16	0	0	25	0	0	73	0	0	7	0
Lane Group Flow (vph)	16	536	0	189	417	0	58	180	0	79	151	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.0	16.0		16.0	16.0		16.0	16.0		16.0	16.0	
Effective Green, g (s)	16.0	16.0		16.0	16.0		16.0	16.0		16.0	16.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.40		0.40	0.40	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	288	728		200	721		489	692		449	737	
v/s Ratio Prot		0.29			0.23			c0.10			0.08	
v/s Ratio Perm	0.02			c0.38			0.05			0.07		
v/c Ratio	0.06	0.74		0.94	0.58		0.12	0.26		0.18	0.21	
Uniform Delay, d1	7.4	10.2		11.6	9.4		7.6	8.0		7.7	7.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	6.5		50.7	3.4		0.5	0.9		0.9	0.6	
Delay (s)	7.7	16.7		62.3	12.7		8.1	9.0		8.6	8.5	
Level of Service	A	B		E	B		A	A		A	A	
Approach Delay (s)		16.5			27.6			8.8			8.5	
Approach LOS		B			C			A			A	

Intersection Summary			
HCM Average Control Delay	18.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

## **Appendix K-D: Peak Hour Intersection Analysis Worksheets – 2035 with Project Conditions**



HCM Signalized Intersection Capacity Analysis

1: Washington St & First Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0				
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00				
Frb, ped/bikes	1.00	0.98		1.00	0.99			0.99				
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00				
Frt	1.00	0.99		1.00	0.97			0.97				
Flt Protected	0.95	1.00		0.95	1.00			0.98				
Satd. Flow (prot)	1770	3428		1770	3380			1763				
Flt Permitted	0.08	1.00		0.19	1.00			0.98				
Satd. Flow (perm)	149	3428		362	3380			1763				
Volume (vph)	130	845	85	95	1135	290	190	185	90	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	137	889	89	100	1195	305	200	195	95	0	0	0
RTOR Reduction (vph)	0	7	0	0	23	0	0	9	0	0	0	0
Lane Group Flow (vph)	137	971	0	100	1477	0	0	481	0	0	0	0
Confl. Peds. (#/hr)			58			32			26			49
Confl. Bikes (#/hr)			19			7			4			6
Turn Type	pm+pt			pm+pt			Perm					
Protected Phases	5	2		1	6			4				
Permitted Phases	2			6			4					
Actuated Green, G (s)	54.7	49.1		49.9	46.7			31.1				
Effective Green, g (s)	56.0	50.0		51.2	47.6			32.0				
Actuated g/C Ratio	0.56	0.50		0.51	0.48			0.32				
Clearance Time (s)	4.4	4.9		4.4	4.9			4.9				
Vehicle Extension (s)	2.0	1.0		2.0	1.0			1.0				
Lane Grp Cap (vph)	181	1714		236	1609			564				
v/s Ratio Prot	c0.05	0.28		0.02	c0.44							
v/s Ratio Perm	0.38			0.20				0.27				
v/c Ratio	0.76	0.57		0.42	0.92			0.85				
Uniform Delay, d1	38.8	17.4		25.7	24.4			31.8				
Progression Factor	1.07	1.02		0.29	0.47			1.00				
Incremental Delay, d2	14.0	1.3		0.3	6.6			15.1				
Delay (s)	55.5	19.1		7.7	18.1			46.9				
Level of Service	E	B		A	B			D				
Approach Delay (s)		23.5			17.4			46.9			0.0	
Approach LOS		C			B			D			A	
<b>Intersection Summary</b>												
HCM Average Control Delay	24.1		HCM Level of Service		C							
HCM Volume to Capacity ratio	0.86											
Actuated Cycle Length (s)	100.0		Sum of lost time (s)		12.0							
Intersection Capacity Utilization	91.3%		ICU Level of Service		F							
Analysis Period (min)	15											
c	Critical Lane Group											



HCM Signalized Intersection Capacity Analysis

4: Washington St & Goldfinch St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frft	1.00	0.99		1.00	0.98		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3496		1770	3448		1770	1762		1770	1813	
Flt Permitted	0.95	1.00		0.95	1.00		0.36	1.00		0.52	1.00	
Satd. Flow (perm)	1770	3496		1770	3448		664	1762		962	1813	
Volume (vph)	280	680	60	100	1170	140	90	105	60	155	205	30
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	295	716	63	105	1232	147	95	111	63	163	216	32
RTOR Reduction (vph)	0	5	0	0	10	0	0	26	0	0	6	0
Lane Group Flow (vph)	295	774	0	105	1369	0	95	148	0	163	242	0
Confl. Peds. (#/hr)						27						27
Confl. Bikes (#/hr)						3						16
Turn Type	Prot			Prot			Perm		Perm			Perm
Protected Phases	5	2		1	6			8				4
Permitted Phases							8					4
Actuated Green, G (s)	20.1	49.8		9.1	38.4		18.2	18.2		17.3	17.3	
Effective Green, g (s)	20.5	50.7		9.1	39.3		18.2	18.2		18.2	18.2	
Actuated g/C Ratio	0.23	0.56		0.10	0.44		0.20	0.20		0.20	0.20	
Clearance Time (s)	4.4	4.9		4.0	4.9		4.0	4.0		4.9	4.9	
Vehicle Extension (s)	2.0	3.3		3.0	3.3		3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)	403	1969		179	1506		134	356		195	367	
v/s Ratio Prot	c0.17	0.22		0.06	c0.40			0.08			0.13	
v/s Ratio Perm							0.14			c0.17		
v/c Ratio	0.73	0.39		0.59	0.91		0.71	0.42		0.84	0.66	
Uniform Delay, d1	32.2	11.0		38.7	23.7		33.4	31.3		34.5	33.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.8	0.6		4.8	9.7		15.8	0.8		24.5	3.2	
Delay (s)	38.0	11.6		43.5	33.3		49.2	32.1		59.0	36.3	
Level of Service	D	B		D	C		D	C		E	D	
Approach Delay (s)		18.9			34.1			38.1			45.3	
Approach LOS		B			C			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay	30.8		HCM Level of Service				C					
HCM Volume to Capacity ratio	0.85											
Actuated Cycle Length (s)	90.0		Sum of lost time (s)				12.0					
Intersection Capacity Utilization	88.5%		ICU Level of Service				E					
Analysis Period (min)	15											
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis

5: Washington St & Front St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑			↑↑			↑↓		↑	↑	↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	4.0	
Lane Util. Factor		0.95			0.95			1.00		0.95	0.95	1.00	
Frbp, ped/bikes		1.00			1.00			1.00		1.00	1.00	0.95	
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	1.00	
Frt		1.00			1.00			0.86		1.00	1.00	0.85	
Flt Protected		1.00			1.00			1.00		0.95	0.95	1.00	
Satd. Flow (prot)		3536			3539			1611		1681	1681	1499	
Flt Permitted		1.00			1.00			1.00		0.75	0.75	1.00	
Satd. Flow (perm)		3536			3539			1611		1335	1335	1499	
Volume (vph)	0	900	5	0	1335	0	0	0	5	185	0	185	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	102%	100%	100%	
Adj. Flow (vph)	0	947	5	0	1405	0	0	0	5	199	0	195	
RTOR Reduction (vph)	0	0	0	0	0	0	0	4	0	0	0	34	
Lane Group Flow (vph)	0	952	0	0	1405	0	0	1	0	100	99	161	
Confl. Peds. (#/hr)								36				19	
Confl. Bikes (#/hr)								6				16	
Turn Type				Perm			Perm			Perm		Perm	
Protected Phases		2			6			8				4	
Permitted Phases				6			8			4		4	
Actuated Green, G (s)		73.9			73.9			17.2		16.3	16.3	16.3	
Effective Green, g (s)		74.8			74.8			17.2		17.2	17.2	17.2	
Actuated g/C Ratio		0.75			0.75			0.17		0.17	0.17	0.17	
Clearance Time (s)		4.9			4.9			4.0		4.9	4.9	4.9	
Vehicle Extension (s)		3.0			3.0			3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)		2645			2647			277		230	230	258	
v/s Ratio Prot		0.27			0.40			0.00					
v/s Ratio Perm										0.07	0.07	0.11	
v/c Ratio		0.36			0.53			0.00		0.43	0.43	0.62	
Uniform Delay, d1		4.3			5.3			34.3		37.0	37.0	38.4	
Progression Factor		1.00			0.14			1.00		1.00	1.00	1.00	
Incremental Delay, d2		0.4			0.4			0.0		1.3	1.3	4.6	
Delay (s)		4.7			1.1			34.3		38.4	38.3	43.0	
Level of Service		A			A			C		D	D	D	
Approach Delay (s)		4.7			1.1			34.3			40.7		
Approach LOS		A			A			C			D		
<b>Intersection Summary</b>													
HCM Average Control Delay			8.1									HCM Level of Service	A
HCM Volume to Capacity ratio			0.55										
Actuated Cycle Length (s)			100.0									Sum of lost time (s)	8.0
Intersection Capacity Utilization			67.5%									ICU Level of Service	C
Analysis Period (min)			15										

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis

7: Washington St & Fourth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0					4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		0.97	0.95					0.95	0.95	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99					1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00					1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.99					1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00					0.95	0.99	1.00
Satd. Flow (prot)	1770	3405		3433	3442					1681	1744	1530
Flt Permitted	0.95	1.00		0.95	1.00					0.95	0.99	1.00
Satd. Flow (perm)	1770	3405		3433	3442					1681	1744	1530
Volume (vph)	115	725	145	295	1550	130	0	0	0	245	140	190
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	121	763	153	311	1632	137	0	0	0	258	147	200
RTOR Reduction (vph)	0	12	0	0	5	0	0	0	0	0	0	103
Lane Group Flow (vph)	121	904	0	311	1764	0	0	0	0	197	208	97
Confl. Peds. (#/hr)			43			35						10
Confl. Bikes (#/hr)			10			10			1			10
Bus Blockages (#/hr)	0	0	0	0	4	0	0	0	0	0	0	0
Turn Type	Prot			Prot						Perm		Perm
Protected Phases	5	2		1	6						4	
Permitted Phases										4		4
Actuated Green, G (s)	5.3	59.0		10.0	63.7					16.8	16.8	16.8
Effective Green, g (s)	5.7	59.9		10.4	64.6					17.7	17.7	17.7
Actuated g/C Ratio	0.06	0.60		0.10	0.65					0.18	0.18	0.18
Clearance Time (s)	4.4	4.9		4.4	4.9					4.9	4.9	4.9
Vehicle Extension (s)	2.0	0.2		1.0	0.2					1.0	1.0	1.0
Lane Grp Cap (vph)	101	2040		357	2224					298	309	271
v/s Ratio Prot	0.07	0.27		c0.09	c0.51							
v/s Ratio Perm										0.12	0.12	0.06
v/c Ratio	1.20	0.44		0.87	0.79					0.66	0.67	0.36
Uniform Delay, d1	47.1	10.9		44.1	12.9					38.4	38.4	36.2
Progression Factor	0.68	0.77		0.90	0.63					1.00	1.00	1.00
Incremental Delay, d2	145.3	0.6		12.6	1.8					4.2	4.5	0.3
Delay (s)	177.5	9.0		52.5	9.9					42.6	42.9	36.5
Level of Service	F	A		D	A					D	D	D
Approach Delay (s)		28.7			16.3			0.0			40.7	
Approach LOS		C			B			A			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.7									HCM Level of Service C
HCM Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			100.0									Sum of lost time (s) 8.0
Intersection Capacity Utilization			78.4%									ICU Level of Service D
Analysis Period (min)			15									



HCM Signalized Intersection Capacity Analysis

11: Washington St & SR-163 Off-Ramp

10/17/2013

	→	↘	←	↙	↖	↑	↗	↘	↓	↙	↘	↗
Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR	SWR	SWR2
Lane Configurations	↑↑		↑↑			↑↓			↑↓			↑↓
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0			4.0		4.0	
Lane Util. Factor	0.95		0.95			1.00			1.00		1.00	
Frbp, ped/bikes	0.99		1.00			1.00			0.99		1.00	
Flpb, ped/bikes	1.00		1.00			1.00			1.00		1.00	
Frt	0.99		1.00			0.98			0.97		0.86	
Flt Protected	1.00		1.00			0.96			0.98		1.00	
Satd. Flow (prot)	3465		3534			1758			1757		1611	
Flt Permitted	1.00		1.00			0.77			0.88		1.00	
Satd. Flow (perm)	3465		3534			1410			1588		1611	
Volume (vph)	950	95	1135	10	110	10	20	20	15	10	615	15
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1000	100	1195	11	116	11	21	21	16	11	647	16
RTOR Reduction (vph)	6	0	0	0	0	5	0	0	10	0	1	0
Lane Group Flow (vph)	1094	0	1206	0	0	143	0	0	38	0	662	0
Confl. Peds. (#/hr)		18		1						7		
Turn Type					Perm			Perm			custom	
Protected Phases	2		6			8			4		5	
Permitted Phases					8			4				
Actuated Green, G (s)	54.5		54.5			15.5			15.0		36.5	
Effective Green, g (s)	55.5		55.5			15.5			15.5		37.0	
Actuated g/C Ratio	0.46		0.46			0.13			0.13		0.31	
Clearance Time (s)	5.0		5.0			4.0			4.5		4.5	
Vehicle Extension (s)	2.0		2.0			0.9			2.0		2.0	
Lane Grp Cap (vph)	1603		1634			182			205		497	
v/s Ratio Prot	0.32		c0.34								c0.41	
v/s Ratio Perm						c0.10			0.02			
v/c Ratio	0.68		0.74			0.78			0.19		1.33	
Uniform Delay, d1	25.3		26.3			50.6			46.6		41.5	
Progression Factor	1.00		0.88			1.00			1.00		1.00	
Incremental Delay, d2	2.4		2.2			18.2			0.2		163.0	
Delay (s)	27.7		25.4			68.8			46.8		204.5	
Level of Service	C		C			E			D		F	
Approach Delay (s)	27.7		25.4			68.8			46.8			
Approach LOS	C		C			E			D			
<b>Intersection Summary</b>												
HCM Average Control Delay			66.1			HCM Level of Service			E			
HCM Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			94.0%			ICU Level of Service			F			
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis

14: Normal St & Park Blvd

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↕	↗	↖	↕↕	↗	↖	↕↕	↗	↖	↕↕	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.92	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1534	1770	3539	1535	1770	3539	1526	1770	3129	1441
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1534	1770	3539	1535	1770	3539	1526	1770	3129	1441
Volume (vph)	225	315	50	145	705	80	55	110	85	45	195	410
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	237	332	53	153	742	84	58	116	89	47	205	432
RTOR Reduction (vph)	0	0	34	0	0	54	0	0	0	0	164	164
Lane Group Flow (vph)	237	332	19	153	742	30	58	116	89	47	257	52
Confl. Peds. (#/hr)			5			16			38			
Confl. Bikes (#/hr)			25			16			1			
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Prot
Protected Phases	5	2		1	6		3	8		7	4	4
Permitted Phases			2			6			8			
Actuated Green, G (s)	7.9	26.6	26.6	8.3	26.5	26.5	4.2	19.4	19.4	2.0	17.2	17.2
Effective Green, g (s)	9.8	28.5	28.5	9.7	28.4	28.4	5.6	21.3	21.3	3.4	19.1	19.1
Actuated g/C Ratio	0.12	0.36	0.36	0.12	0.36	0.36	0.07	0.27	0.27	0.04	0.24	0.24
Clearance Time (s)	5.9	5.9	5.9	5.4	5.9	5.9	5.4	5.9	5.9	5.4	5.9	5.9
Vehicle Extension (s)	2.0	4.8	4.8	2.0	3.8	3.8	2.0	3.5	3.5	2.0	3.9	3.9
Lane Grp Cap (vph)	426	1278	554	218	1274	553	126	955	412	76	757	349
v/s Ratio Prot	0.07	0.09		c0.09	c0.21		c0.03	0.03		0.03	c0.08	0.04
v/s Ratio Perm			0.01			0.02			0.06			
v/c Ratio	0.56	0.26	0.03	0.70	0.58	0.05	0.46	0.12	0.22	0.62	0.34	0.15
Uniform Delay, d1	32.5	17.8	16.3	33.2	20.4	16.5	35.2	21.7	22.3	37.1	24.7	23.5
Progression 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
Incremental Delay, d2	0.9	0.2	0.0	8.1	0.8	0.1	1.0	0.1	0.3	10.1	0.4	0.3
Delay (s)	33.4	18.0	16.4	41.3	21.2	16.5	36.2	21.8	22.6	47.2	25.1	23.8
Level of Service	C	B	B	D	C	B	D	C	C	D	C	C
Approach Delay (s)		23.7			24.0			25.3			26.2	
Approach LOS		C			C			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			24.6				HCM Level of Service				C	
HCM Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			78.9				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			73.4%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis

15: University Ave & First Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0				4.0		4.0				4.0	
Lane Util. Factor	1.00				1.00		1.00				1.00	
Frbp, ped/bikes	0.97				0.91		0.99				0.98	
Flpb, ped/bikes	1.00				1.00		1.00				1.00	
Frt	0.97				0.92		0.98				0.98	
Flt Protected	0.99				0.99		0.99				0.99	
Satd. Flow (prot)	1738				1549		1788				1771	
Flt Permitted	0.90				0.88		0.91				0.91	
Satd. Flow (perm)	1585				1375		1637				1623	
Volume (vph)	75	250	100	45	50	145	70	265	60	40	165	45
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	79	263	105	47	53	153	74	279	63	42	174	47
RTOR Reduction (vph)	0	16	0	0	79	0	0	15	0	0	18	0
Lane Group Flow (vph)	0	431	0	0	174	0	0	401	0	0	245	0
Confl. Peds. (#/hr)			37				52		34			
Confl. Bikes (#/hr)			50				50				51	
Turn Type	Perm				Perm		Perm				Perm	
Protected Phases			2				2		4			
Permitted Phases	2				2		4				4	
Actuated Green, G (s)	25.7				25.7		19.5				19.5	
Effective Green, g (s)	26.6				26.6		20.4				20.4	
Actuated g/C Ratio	0.48				0.48		0.37				0.37	
Clearance Time (s)	4.9				4.9		4.9				4.9	
Vehicle Extension (s)	2.0				2.0		2.0				2.0	
Lane Grp Cap (vph)	767				665		607				602	
v/s Ratio Prot												
v/s Ratio Perm	c0.27				0.13		c0.24				0.15	
v/c Ratio	0.56				0.26		0.66				0.41	
Uniform Delay, d1	10.1				8.4		14.4				12.8	
Progression Factor	1.00				2.54		1.00				1.00	
Incremental Delay, d2	3.0				0.9		2.1				0.2	
Delay (s)	13.0				22.2		16.5				13.0	
Level of Service	B				C		B				B	
Approach Delay (s)	13.0				22.2		16.5				13.0	
Approach LOS	B				C		B				B	
<b>Intersection Summary</b>												
HCM Average Control Delay	15.8				HCM Level of Service		B					
HCM Volume to Capacity ratio	0.60											
Actuated Cycle Length (s)	55.0				Sum of lost time (s)		8.0					
Intersection Capacity Utilization	68.4%				ICU Level of Service		C					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
16: University Ave & Fourth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0						4.0	
Lane Util. Factor		1.00		1.00	1.00						0.95	
Frpb, ped/bikes		0.99		1.00	1.00						1.00	
Flpb, ped/bikes		1.00		1.00	1.00						1.00	
Frt		0.99		1.00	1.00						1.00	
Flt Protected		1.00		0.95	1.00						1.00	
Satd. Flow (prot)		1815		1770	1833						3532	
Flt Permitted		1.00		0.45	1.00						1.00	
Satd. Flow (perm)		1815		844	1833						3532	
Volume (vph)	0	340	40	100	365	0	0	0	0	20	490	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	358	42	105	384	0	0	0	0	21	516	0
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	398	0	105	384	0	0	0	0	0	537	0
Confl. Peds. (#/hr)			47			49			21			55
Confl. Bikes (#/hr)			50			50			50			
Bus Blockages (#/hr)	0	0	0	0	4	0	0	0	0	0	0	0
Turn Type				pm+pt							Perm	
Protected Phases		2		1	6							4
Permitted Phases				6						4		
Actuated Green, G (s)		62.3		75.2	74.7						21.4	
Effective Green, g (s)		63.2		75.6	75.6						22.3	
Actuated g/C Ratio		0.57		0.69	0.69						0.20	
Clearance Time (s)		4.9		4.4	4.9						4.9	
Vehicle Extension (s)		2.0		3.0	2.0						2.0	
Lane Grp Cap (vph)		1043		651	1260						716	
v/s Ratio Prot		c0.22		0.01	c0.21							
v/s Ratio Perm				0.10							0.15	
v/c Ratio		0.38		0.16	0.30						0.75	
Uniform Delay, d1		12.8		9.8	6.8						41.2	
Progression Factor		0.98		1.88	1.71						1.00	
Incremental Delay, d2		0.9		0.1	0.0						3.9	
Delay (s)		13.4		18.4	11.7						45.2	
Level of Service		B		B	B						D	
Approach Delay (s)		13.4			13.1			0.0			45.2	
Approach LOS		B			B			A			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			25.3			HCM Level of Service					C	
HCM Volume to Capacity ratio			0.45									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)			12.1			
Intersection Capacity Utilization			56.5%			ICU Level of Service					B	
Analysis Period (min)			15									



HCM Signalized Intersection Capacity Analysis  
17: University Ave & Fifth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔↔			↔↔				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			0.95			0.95				
Frpb, ped/bikes		1.00			0.90			0.93				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.95			0.96				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		1859			3008			3157				
Flt Permitted		0.94			1.00			1.00				
Satd. Flow (perm)		1752			3008			3157				
Volume (vph)	20	475	0	0	620	350	40	420	165	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	500	0	0	653	368	42	442	174	0	0	0
RTOR Reduction (vph)	0	0	0	0	52	0	0	42	0	0	0	0
Lane Group Flow (vph)	0	521	0	0	969	0	0	616	0	0	0	0
Confl. Peds. (#/hr)			134			136			97			91
Confl. Bikes (#/hr)			50			50						50
Turn Type	Perm			Perm						Perm		
Protected Phases		2			2			4				
Permitted Phases	2						4					
Actuated Green, G (s)		61.9			61.9			27.7				
Effective Green, g (s)		62.8			62.8			28.6				
Actuated g/C Ratio		0.57			0.57			0.26				
Clearance Time (s)		4.9			4.9			4.9				
Vehicle Extension (s)		1.0			1.0			1.0				
Lane Grp Cap (vph)		1000			1717			821				
v/s Ratio Prot					0.32							
v/s Ratio Perm		0.30						0.20				
v/c Ratio		0.52			0.56			0.75				
Uniform Delay, d1		14.4			14.9			37.4				
Progression Factor		1.04			0.97			1.00				
Incremental Delay, d2		1.9			1.1			3.4				
Delay (s)		16.8			15.6			40.9				
Level of Service		B			B			D				
Approach Delay (s)		16.8			15.6			40.9			0.0	
Approach LOS		B			B			D			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.4					HCM Level of Service			C	
HCM Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			110.0					Sum of lost time (s)			18.6	
Intersection Capacity Utilization			70.8%					ICU Level of Service			C	
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis  
18: University Ave & Sixth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔		↔	↔		↔		↔		↔		↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	1.00		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.97		1.00	0.92		1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frnt	1.00	0.98		1.00	0.93		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	1682		1770	3041		1770	3506		1770	3539	1522
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	1682		1770	3041		1770	3506		1770	3539	1522
Volume (vph)	500	150	25	170	320	255	50	730	40	220	1050	520
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	526	158	26	179	337	268	53	768	42	232	1105	547
RTOR Reduction (vph)	0	5	0	0	127	0	0	4	0	0	0	67
Lane Group Flow (vph)	526	179	0	179	478	0	53	806	0	232	1105	480
Confl. Peds. (#/hr)			115			121			16			34
Confl. Bikes (#/hr)			50			50						
Bus Blockages (#/hr)	0	12	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases												4
Actuated Green, G (s)	10.6	29.5		13.6	32.5		5.3	30.1		17.7	42.5	53.1
Effective Green, g (s)	11.0	30.4		14.0	33.4		5.7	31.5		18.1	43.9	54.9
Actuated g/C Ratio	0.10	0.28		0.13	0.30		0.05	0.29		0.16	0.40	0.50
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	5.4		4.4	5.4	4.4
Vehicle Extension (s)	3.0	2.2		2.0	2.2		2.0	3.8		2.0	3.8	3.0
Lane Grp Cap (vph)	343	465		225	923		92	1004		291	1412	760
v/s Ratio Prot	c0.15	0.11		c0.10	c0.16		0.03	c0.23		0.13	c0.31	0.06
v/s Ratio Perm												0.25
v/c Ratio	1.53	0.38		0.80	0.52		0.58	0.80		0.80	0.78	0.63
Uniform Delay, d1	49.5	32.2		46.6	31.7		51.0	36.4		44.2	28.9	20.2
Progression Factor	0.93	0.87		1.00	0.90		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	251.9	2.0		16.2	2.0		5.3	4.9		13.2	3.0	1.7
Delay (s)	298.1	30.0		63.0	30.6		56.3	41.3		57.4	31.9	21.9
Level of Service	F	C		E	C		E	D		E	C	C
Approach Delay (s)		228.6			38.0			42.2			32.1	
Approach LOS		F			D			D			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			68.2				HCM Level of Service					E
HCM Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			110.0				Sum of lost time (s)				12.0	
Intersection Capacity Utilization			84.7%				ICU Level of Service					E
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
19: University Ave & Seventh Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔			↔			↔			↔		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0			4.0			4.0			4.0		
Lane Util. Factor		0.95			0.95			1.00			1.00		
Frbp, ped/bikes		0.93			0.99			0.97			0.99		
Flpb, ped/bikes		1.00			1.00			1.00			1.00		
Frt		0.98			1.00			0.94			0.94		
Flt Protected		1.00			1.00			0.98			0.98		
Satd. Flow (prot)		3131			3421			1672			1705		
Flt Permitted		0.90			0.86			0.86			0.90		
Satd. Flow (perm)		2824			2964			1472			1570		
Volume (vph)	25	365	75	55	565	15	30	5	25	20	10	25	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	26	384	79	58	595	16	32	5	26	21	11	26	
RTOR Reduction (vph)	0	6	0	0	1	0	0	23	0	0	23	0	
Lane Group Flow (vph)	0	483	0	0	668	0	0	40	0	0	35	0	
Confl. Peds. (#/hr)			116			87			35			4	
Confl. Bikes (#/hr)			50			50							
Bus Blockages (#/hr)	0	12	0	0	9	0	0	0	0	0	0	0	
Turn Type	Perm			Perm			Perm			Perm			
Protected Phases		2			2			4			4		
Permitted Phases	2			2			4			4			
Actuated Green, G (s)		88.6			88.6			11.6			11.6		
Effective Green, g (s)		89.5			89.5			12.5			12.5		
Actuated g/C Ratio		0.81			0.81			0.11			0.11		
Clearance Time (s)		4.9			4.9			4.9			4.9		
Vehicle Extension (s)		2.0			2.0			2.0			2.0		
Lane Grp Cap (vph)		2298			2412			167			178		
v/s Ratio Prot													
v/s Ratio Perm		0.17			c0.23			c0.03			0.02		
v/c Ratio		0.21			0.28			0.24			0.20		
Uniform Delay, d1		2.3			2.5			44.4			44.2		
Progression Factor		0.29			0.07			1.00			1.00		
Incremental Delay, d2		0.2			0.3			0.3			0.2		
Delay (s)		0.8			0.4			44.7			44.4		
Level of Service		A			A			D			D		
Approach Delay (s)		0.8			0.4			44.7			44.4		
Approach LOS		A			A			D			D		
<b>Intersection Summary</b>													
HCM Average Control Delay			4.8									HCM Level of Service	A
HCM Volume to Capacity ratio			0.27										
Actuated Cycle Length (s)			110.0									Sum of lost time (s)	8.0
Intersection Capacity Utilization			57.3%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis  
20: University Ave & Eighth St

10/17/2013

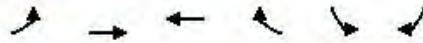
	↖	→	↗	↙	←	↖	↙	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frbp, ped/bikes		0.98			1.00			0.97			0.93	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.98			0.99			0.97			0.92	
Flt Protected		1.00			1.00			1.00			0.98	
Satd. Flow (prot)		3331			3464			1732			1563	
Flt Permitted		0.92			0.87			0.95			0.83	
Satd. Flow (perm)		3058			3034			1654			1325	
Volume (vph)	15	345	45	60	615	65	5	40	15	50	0	65
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	16	363	47	63	647	68	5	42	16	53	0	68
RTOR Reduction (vph)	0	6	0	0	4	0	0	12	0	0	50	0
Lane Group Flow (vph)	0	420	0	0	774	0	0	51	0	0	71	0
Confl. Peds. (#/hr)			38						70			65
Confl. Bikes (#/hr)			50			50						
Bus Blockages (#/hr)	0	12	0	0	0	0	0	0	0	0	0	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			3			4	
Permitted Phases	2			2			3			4		
Actuated Green, G (s)		66.7			66.7			12.6			13.0	
Effective Green, g (s)		68.6			68.6			14.5			14.9	
Actuated g/C Ratio		0.62			0.62			0.13			0.14	
Clearance Time (s)		5.9			5.9			5.9			5.9	
Vehicle Extension (s)		1.0			1.0			2.0			2.0	
Lane Grp Cap (vph)		1907			1892			218			179	
v/s Ratio Prot												
v/s Ratio Perm		0.14			0.26			0.03			0.05	
v/c Ratio		0.22			0.41			0.23			0.40	
Uniform Delay, d1		9.0			10.5			42.8			43.4	
Progression Factor		0.63			0.73			1.00			1.00	
Incremental Delay, d2		0.3			0.6			0.2			0.5	
Delay (s)		5.9			8.3			43.0			44.0	
Level of Service		A			A			D			D	
Approach Delay (s)		5.9			8.3			43.0			44.0	
Approach LOS		A			A			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			12.2				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			110.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			62.7%				ICU Level of Service				B	
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
21: University Ave & Ninth St

10/17/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕		↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		0.95	0.95		1.00	1.00
Frbp, ped/bikes		1.00	0.99		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3534	3419		1770	1539
Flt Permitted		0.93	1.00		0.95	1.00
Satd. Flow (perm)		3306	3419		1770	1539
Volume (vph)	10	355	650	15	125	105
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	374	684	16	132	111
RTOR Reduction (vph)	0	0	1	0	0	74
Lane Group Flow (vph)	0	385	699	0	132	37
Confl. Peds. (#/hr)				94		10
Confl. Bikes (#/hr)				50		
Bus Blockages (#/hr)	0	0	12	0	0	0
Turn Type	Perm				Perm	
Protected Phases		2	6		4	
Permitted Phases	2					4
Actuated Green, G (s)		87.9	87.9		12.8	12.8
Effective Green, g (s)		88.8	88.8		13.2	13.2
Actuated g/C Ratio		0.81	0.81		0.12	0.12
Clearance Time (s)		4.9	4.9		4.4	4.4
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2669	2760		212	185
v/s Ratio Prot			c0.20		c0.07	
v/s Ratio Perm		0.12				0.02
v/c Ratio		0.14	0.25		0.62	0.20
Uniform Delay, d1		2.3	2.6		46.0	43.6
Progression Factor		0.27	0.77		1.00	1.00
Incremental Delay, d2		0.1	0.0		5.6	0.5
Delay (s)		0.7	2.0		51.6	44.2
Level of Service		A	A		D	D
Approach Delay (s)		0.7	2.0		48.2	
Approach LOS		A	A		D	
<b>Intersection Summary</b>						
HCM Average Control Delay			10.1		HCM Level of Service	B
HCM Volume to Capacity ratio			0.30			
Actuated Cycle Length (s)			110.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			35.4%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
22: University Ave & Tenth St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖ ↗		↖ ↗		↖ ↗		↖ ↗		↖ ↗		↖ ↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.96		1.00	0.99		1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.94		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	3206		1770	3485		1770	1703		1770	1716	
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00		0.73	1.00	
Satd. Flow (perm)	1787	3206		1770	3485		1320	1703		1365	1716	
Volume (vph)	50	360	75	190	495	15	95	20	15	5	40	30
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	53	379	79	200	521	16	100	21	16	5	42	32
RTOR Reduction (vph)	0	12	0	0	1	0	0	14	0	0	27	0
Lane Group Flow (vph)	53	446	0	200	536	0	100	23	0	5	47	0
Confl. Peds. (#/hr)			69			102			35			19
Confl. Bikes (#/hr)			50			50						
Heavy Vehicles (%)	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	17	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot		Prot		Perm		Perm		Perm		Perm	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8				4	
Actuated Green, G (s)	5.0	58.6		21.3	74.9		15.9	15.9		15.9	15.9	
Effective Green, g (s)	5.4	59.5		21.7	75.8		16.8	16.8		16.8	16.8	
Actuated g/C Ratio	0.05	0.54		0.20	0.69		0.15	0.15		0.15	0.15	
Clearance Time (s)	4.4	4.9		4.4	4.9		4.9	4.9		4.9	4.9	
Vehicle Extension (s)	2.0	5.3		2.0	3.4		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	88	1734		349	2401		202	260		208	262	
v/s Ratio Prot	c0.03	c0.14		c0.11	0.15			0.01			0.03	
v/s Ratio Perm							c0.08			0.00		
v/c Ratio	0.60	0.26		0.57	0.22		0.50	0.09		0.02	0.18	
Uniform Delay, d1	51.2	13.5		40.0	6.3		42.7	40.0		39.6	40.6	
Progression Factor	1.15	0.82		0.74	0.20		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.6	0.4		1.4	0.2		0.7	0.1		0.0	0.1	
Delay (s)	66.5	11.4		30.8	1.4		43.4	40.1		39.6	40.7	
Level of Service	E	B		C	A		D	D		D	D	
Approach Delay (s)		17.1			9.4			42.5			40.6	
Approach LOS		B			A			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			16.9	HCM Level of Service				B				
HCM Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			110.0	Sum of lost time (s)				12.0				
Intersection Capacity Utilization			59.2%	ICU Level of Service				B				
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
23: University Ave & Vermont St

10/17/2013

	↖	→	↘	↙	←	↖	↙	↑	↘	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖		↖	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	1.00
Frbp, ped/bikes	1.00	0.99		1.00	0.98			0.98		1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.99			0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	1.00
Satd. Flow (prot)	1593	3140		1593	3016			1532		1593	1676	1325
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.73	1.00	1.00
Satd. Flow (perm)	1593	3140		1593	3016			1532		1218	1676	1325
Volume (vph)	35	335	15	35	570	45	0	25	20	20	35	65
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	37	353	16	37	600	47	0	26	21	21	37	68
RTOR Reduction (vph)	0	2	0	0	3	0	0	17	0	0	0	55
Lane Group Flow (vph)	37	367	0	37	644	0	0	30	0	21	37	13
Confl. Peds. (#/hr)			46			86			34			56
Confl. Bikes (#/hr)			50			50						
Bus Blockages (#/hr)	0	0	0	0	12	0	0	0	0	0	0	0
Turn Type	Prot			Prot			Perm			Perm		Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		4
Actuated Green, G (s)	8.1	70.0		5.0	66.9			20.8		20.8	20.8	20.8
Effective Green, g (s)	8.5	70.9		5.4	67.8			21.7		21.7	21.7	21.7
Actuated g/C Ratio	0.08	0.64		0.05	0.62			0.20		0.20	0.20	0.20
Clearance Time (s)	4.4	4.9		4.4	4.9			4.9		4.9	4.9	4.9
Vehicle Extension (s)	2.0	3.2		2.0	3.4			3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	123	2024		78	1859			302		240	331	261
v/s Ratio Prot	c0.02	0.12		c0.02	c0.21			0.02			c0.02	
v/s Ratio Perm										0.02		0.01
v/c Ratio	0.30	0.18		0.47	0.35			0.10		0.09	0.11	0.05
Uniform Delay, d1	47.9	7.9		50.9	10.3			36.2		36.1	36.2	35.8
Progression Factor	0.93	0.17		1.00	1.00			1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2		1.7	0.5			0.1		0.2	0.2	0.1
Delay (s)	45.0	1.6		52.6	10.8			36.3		36.2	36.4	35.9
Level of Service	D	A		D	B			D		D	D	D
Approach Delay (s)		5.5			13.1			36.3			36.1	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
24: University Ave & Richmond St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.97		1.00	0.98		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.98		1.00	0.95		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3275		1770	3323		1770	1746		1770	1745	
Flt Permitted	0.95	1.00		0.95	1.00		0.53	1.00		0.70	1.00	
Satd. Flow (perm)	1770	3275		1770	3323		984	1746		1295	1745	
Volume (vph)	65	275	35	30	605	80	20	60	30	45	130	65
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	68	289	37	32	637	84	21	63	32	47	137	68
RTOR Reduction (vph)	0	8	0	0	9	0	0	23	0	0	33	0
Lane Group Flow (vph)	68	318	0	32	712	0	21	72	0	47	172	0
Confl. Peds. (#/hr)			127			69			43			52
Confl. Bikes (#/hr)			50			50						
Bus Blockages (#/hr)	0	13	0	0	12	0	0	0	0	0	0	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	5.0	42.8		2.2	40.0		20.8	20.8		20.8	20.8	
Effective Green, g (s)	5.4	43.7		2.6	40.9		21.7	21.7		21.7	21.7	
Actuated g/C Ratio	0.07	0.55		0.03	0.51		0.27	0.27		0.27	0.27	
Clearance Time (s)	4.4	4.9		4.4	4.9		4.9	4.9		4.9	4.9	
Vehicle Extension (s)	2.0	3.2		2.0	3.1		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	119	1789		58	1699		267	474		351	473	
v/s Ratio Prot	c0.04	c0.10		0.02	c0.21			0.04			c0.10	
v/s Ratio Perm							0.02			0.04		
v/c Ratio	0.57	0.18		0.55	0.42		0.08	0.15		0.13	0.36	
Uniform Delay, d1	36.2	9.1		38.1	12.2		21.7	22.2		22.0	23.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.1	0.2		6.3	0.8		0.0	0.1		0.1	0.2	
Delay (s)	40.2	9.3		44.4	12.9		21.8	22.2		22.1	23.7	
Level of Service	D	A		D	B		C	C		C	C	
Approach Delay (s)		14.7			14.3			22.1			23.4	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
25: University Ave & Normal St

10/17/2013

	↖	→	←	↗	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↗↗	↗↗		↖	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.99		1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.98		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	3398		1770	1481
Flt Permitted	0.42	1.00	1.00		0.95	1.00
Satd. Flow (perm)	781	3539	3398		1770	1481
Volume (vph)	40	265	475	60	55	40
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	279	500	63	58	42
RTOR Reduction (vph)	0	0	8	0	0	30
Lane Group Flow (vph)	42	279	555	0	58	12
Confl. Peds. (#/hr)				58		75
Confl. Bikes (#/hr)				50		
Bus Blockages (#/hr)	0	0	8	0	0	0
Turn Type	Perm				Perm	
Protected Phases		2	6		4	
Permitted Phases	2					4
Actuated Green, G (s)	51.5	51.5	51.5		24.7	24.7
Effective Green, g (s)	52.4	52.4	52.4		25.1	25.1
Actuated g/C Ratio	0.61	0.61	0.61		0.29	0.29
Clearance Time (s)	4.9	4.9	4.9		4.4	4.4
Vehicle Extension (s)	4.8	4.8	3.9		2.0	2.0
Lane Grp Cap (vph)	479	2169	2083		520	435
v/s Ratio Prot		0.08	c0.16		c0.03	
v/s Ratio Perm	0.05					0.01
v/c Ratio	0.09	0.13	0.27		0.11	0.03
Uniform Delay, d1	6.8	7.0	7.7		22.1	21.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	0.1	0.1		0.0	0.0
Delay (s)	6.9	7.0	7.7		22.1	21.5
Level of Service	A	A	A		C	C
Approach Delay (s)		7.0	7.7		21.9	
Approach LOS		A	A		C	
<b>Intersection Summary</b>						
HCM Average Control Delay			8.9		HCM Level of Service	A
HCM Volume to Capacity ratio			0.22			
Actuated Cycle Length (s)			85.5		Sum of lost time (s)	8.0
Intersection Capacity Utilization			67.7%		ICU Level of Service	C
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

26: University Ave & Park Blvd

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↕	↗	↘	↕	↗	↘	↕	↗	↘	↕	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.98		1.00	0.99		1.00	0.99		1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.97		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3234		1770	3408		1770	3357		1770	3539	1476
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3234		1770	3408		1770	3357		1770	3539	1476
Volume (vph)	40	180	80	115	410	100	85	150	55	50	290	55
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	189	84	121	432	105	89	158	58	53	305	58
RTOR Reduction (vph)	0	49	0	0	18	0	0	40	0	0	0	43
Lane Group Flow (vph)	42	224	0	121	519	0	89	176	0	53	305	15
Confl. Peds. (#/hr)			68			42			43			60
Confl. Bikes (#/hr)			8			8			8			8
Bus Blockages (#/hr)	0	12	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot			Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												4
Actuated Green, G (s)	2.0	25.6		7.8	31.4		5.4	21.2		2.9	18.7	18.7
Effective Green, g (s)	2.4	26.5		8.2	32.3		5.8	22.1		3.3	19.6	19.6
Actuated g/C Ratio	0.03	0.35		0.11	0.42		0.08	0.29		0.04	0.26	0.26
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	4.9		4.4	4.9	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	3.3		2.0	2.9	2.9
Lane Grp Cap (vph)	56	1126		191	1446		135	975		77	911	380
v/s Ratio Prot	0.02	0.07		c0.07	c0.15		c0.05	0.05		0.03	c0.09	
v/s Ratio Perm												0.01
v/c Ratio	0.75	0.20		0.63	0.36		0.66	0.18		0.69	0.33	0.04
Uniform Delay, d1	36.6	17.4		32.5	14.9		34.2	20.2		35.9	23.0	21.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	42.7	0.0		6.7	0.1		11.1	0.1		18.4	0.2	0.0
Delay (s)	79.2	17.4		39.2	14.9		45.3	20.3		54.3	23.2	21.2
Level of Service	E	B		D	B		D	C		D	C	C
Approach Delay (s)		25.6			19.4			27.6			26.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	76.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
27: Washington St & SR-163 On-Ramp

10/17/2013

	↖	→	↗	↙	←	↖	↙	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↖↖	↖		↖↖	↖			↖			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0			4.0			
Lane Util. Factor	1.00	0.91	1.00		0.91	0.91			1.00			
Frbp, ped/bikes	1.00	1.00	0.98		0.99	0.99			1.00			
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00			1.00			
Frt	1.00	1.00	0.85		0.94	0.85			0.86			
Flt Protected	0.95	1.00	1.00		1.00	1.00			1.00			
Satd. Flow (prot)	1770	5085	1544		3154	1422			1603			
Flt Permitted	0.95	1.00	1.00		1.00	1.00			1.00			
Satd. Flow (perm)	1770	5085	1544		3154	1422			1603			
Volume (vph)	470	995	180	0	905	1535	0	0	15	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	495	1047	189	0	953	1616	0	0	16	0	0	0
RTOR Reduction (vph)	0	0	0	0	70	135	0	0	0	0	0	0
Lane Group Flow (vph)	495	1047	189	0	1602	762	0	0	16	0	0	0
Confl. Peds. (#/hr)			1									1
Confl. Bikes (#/hr)			11			2						
Turn Type	Prot		Perm			Perm				custom		
Protected Phases	5	2			6							
Permitted Phases			2			6			2			
Actuated Green, G (s)	39.4	120.0	120.0		71.3	71.3			120.0			
Effective Green, g (s)	39.8	120.0	120.0		72.2	72.2			120.0			
Actuated g/C Ratio	0.33	1.00	1.00		0.60	0.60			1.00			
Clearance Time (s)	4.4	2.0	2.0		4.9	4.9			2.0			
Vehicle Extension (s)	2.0	3.0	3.0		2.8	2.8			3.0			
Lane Grp Cap (vph)	587	5085	1544		1898	856			1603			
v/s Ratio Prot	c0.28	0.21			0.51							
v/s Ratio Perm			0.12			c0.54			0.01			
v/c Ratio	0.84	0.21	0.12		0.84	0.89			0.01			
Uniform Delay, d1	37.2	0.0	0.0		19.3	20.5			0.0			
Progression Factor	0.67	1.00	1.00		0.77	1.17			1.00			
Incremental Delay, d2	9.6	0.1	0.2		2.1	6.3			0.0			
Delay (s)	34.5	0.1	0.2		16.9	30.2			0.0			
Level of Service	C	A	A		B	C			A			
Approach Delay (s)		9.9			21.6			0.0			0.0	
Approach LOS		A			C			A			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			16.8			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			96.1%			ICU Level of Service			F			
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
28: Washington St & Lincoln Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗			↖↗		↖	↗			↖	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	0.91			0.91		1.00	1.00			1.00	1.00
Frbp, ped/bikes	1.00	0.99			1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.97			1.00		1.00	1.00			1.00	0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1770	4896			5078		1770	1863			1842	1583
Flt Permitted	0.95	1.00			1.00		0.95	1.00			0.99	1.00
Satd. Flow (perm)	1770	4896			5078		1770	1863			1842	1583
Volume (vph)	65	760	190	0	1840	15	375	10	0	10	35	295
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	68	800	200	0	1937	16	395	11	0	11	37	311
RTOR Reduction (vph)	0	21	0	0	0	0	0	0	0	0	0	291
Lane Group Flow (vph)	68	979	0	0	1953	0	395	11	0	0	48	20
Confl. Peds. (#/hr)			6				4		19			
Confl. Bikes (#/hr)			7				3					1
Turn Type	Prot						Split			Split		Prot
Protected Phases	5	2			6		3	3		4	4	4
Permitted Phases												
Actuated Green, G (s)	7.0	74.2			62.7		12.1	12.1			7.0	7.0
Effective Green, g (s)	7.4	75.1			63.7		13.0	13.0			7.9	7.9
Actuated g/C Ratio	0.06	0.63			0.53		0.11	0.11			0.07	0.07
Clearance Time (s)	4.4	4.9			5.0		4.9	4.9			4.9	4.9
Vehicle Extension (s)	2.0	5.7			6.0		3.0	3.0			2.0	2.0
Lane Grp Cap (vph)	109	3064			2696		192	202			121	104
v/s Ratio Prot	c0.04	0.20			c0.38		c0.22	0.01			c0.03	0.01
v/s Ratio Perm												
v/c Ratio	0.62	0.32			0.72		2.06	0.05			0.40	0.20
Uniform Delay, d1	54.9	10.5			21.5		53.5	48.0			53.8	53.0
Progression Factor	0.84	1.27			1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	7.7	0.3			1.4		493.4	0.1			0.8	0.3
Delay (s)	53.8	13.6			22.8		546.9	48.1			54.5	53.4
Level of Service	D	B			C		F	D			D	D
Approach Delay (s)		16.2			22.8		533.4				53.5	
Approach LOS		B			C		F				D	
<b>Intersection Summary</b>												
HCM Average Control Delay			78.6				HCM Level of Service				E	
HCM Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			28.0		
Intersection Capacity Utilization			84.9%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
32: Robinson Ave & Park Blvd

10/17/2013

	↖	→	↗	↙	←	↖	↙	↑	↗	↘	↓	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL2	SBL	SBT
Lane Configurations	↖	↗			↕			↕			↘	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00			0.95			1.00	0.95
Frbp, ped/bikes	1.00	0.99			0.99			1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	0.97			0.96			1.00			1.00	0.99
Flt Protected	0.95	1.00			1.00			0.99			0.95	1.00
Satd. Flow (prot)	1770	1785			1762			3472			1770	3493
Flt Permitted	0.55	1.00			0.97			0.73			0.51	1.00
Satd. Flow (perm)	1022	1785			1716			2560			956	3493
Volume (vph)	30	40	10	25	160	85	105	270	10	55	15	565
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	42	11	26	168	89	111	284	11	58	16	595
RTOR Reduction (vph)	0	0	0	0	33	0	0	0	0	0	0	7
Lane Group Flow (vph)	32	53	0	0	250	0	0	406	0	0	74	630
Confl. Peds. (#/hr)			24				23			18		
Confl. Bikes (#/hr)			9				2			22		
Turn Type	Perm			Perm			Perm			Perm	Perm	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	9.4	9.4			9.4			19.3			19.3	19.3
Effective Green, g (s)	10.3	10.3			10.3			20.2			20.2	20.2
Actuated g/C Ratio	0.27	0.27			0.27			0.52			0.52	0.52
Clearance Time (s)	4.9	4.9			4.9			4.9			4.9	4.9
Vehicle Extension (s)	2.0	2.0			2.0			3.5			3.5	3.5
Lane Grp Cap (vph)	273	478			459			1343			502	1833
v/s Ratio Prot		0.03										c0.18
v/s Ratio Perm	0.03				c0.15			0.16			0.08	
v/c Ratio	0.12	0.11			0.54			0.30			0.15	0.34
Uniform Delay, d1	10.7	10.6			12.1			5.2			4.7	5.3
Progression Factor	1.00	1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2	0.1	0.0			0.7			0.2			0.2	0.1
Delay (s)	10.7	10.7			12.8			5.3			4.9	5.4
Level of Service	B	B			B			A			A	A
Approach Delay (s)		10.7			12.8			5.3				5.4
Approach LOS		B			B			A				A
<b>Intersection Summary</b>												
HCM Average Control Delay	7.1		HCM Level of Service		A							
HCM Volume to Capacity ratio	0.41											
Actuated Cycle Length (s)	38.5		Sum of lost time (s)		8.0							
Intersection Capacity Utilization	65.5%		ICU Level of Service		C							
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
 32: Robinson Ave & Park Blvd

10/17/2013

Movement	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frbp, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Volume (vph)	40
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	42
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	35
Confl. Bikes (#/hr)	8
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	



HCM Unsignalized Intersection Capacity Analysis  
35: University Ave & Hawk St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	30	10	50	15	30	5	15	10	0	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	32	11	53	16	32	5	16	11	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (ft)					324							
pX, platoon unblocked												
vC, conflicting volume	68			32			97	105	16	116	113	61
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	68			32			97	105	16	116	113	61
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			96	99	99	99	100	100
cM capacity (veh/h)	1533			1581			880	780	1063	839	772	1005
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	32	79	53	11								
Volume Left	0	11	32	11								
Volume Right	32	16	16	0								
cSH	1533	1581	916	839								
Volume to Capacity	0.00	0.01	0.06	0.01								
Queue Length 95th (ft)	0	1	5	1								
Control Delay (s)	0.0	1.0	9.2	9.3								
Lane LOS		A	A	A								
Approach Delay (s)	0.0	1.0	9.2	9.3								
Approach LOS			A	A								
<b>Intersection Summary</b>												
Average Delay			3.8									
Intersection Capacity Utilization			20.8%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

40: University Ave & Goldfinch St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00			1.00	0.85		1.00	0.92		1.00	0.99	
Flt Protected	0.95			0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770			1770	1583		1770	1716		1770	1845	
Flt Permitted	0.71			0.76	1.00		0.60	1.00		0.57	1.00	
Satd. Flow (perm)	1328			1410	1583		1116	1716		1068	1845	
Volume (vph)	20	0	0	30	0	65	50	125	140	150	230	15
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	0	0	32	0	68	53	132	147	158	242	16
RTOR Reduction (vph)	0	0	0	0	41	0	0	88	0	0	6	0
Lane Group Flow (vph)	21	0	0	32	27	0	53	191	0	158	252	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.0			16.0		16.0	16.0		16.0	16.0		16.0
Effective Green, g (s)	16.0			16.0		16.0	16.0		16.0	16.0		16.0
Actuated g/C Ratio	0.40			0.40		0.40	0.40		0.40	0.40		0.40
Clearance Time (s)	4.0			4.0		4.0	4.0		4.0	4.0		4.0
Lane Grp Cap (vph)	531			564		633	446		686	427		738
v/s Ratio Prot					0.02			0.11			0.14	
v/s Ratio Perm	0.02			0.02			0.05			0.15		
v/c Ratio	0.04			0.06		0.04	0.12		0.28	0.37		0.34
Uniform Delay, d1	7.3			7.4		7.3	7.6		8.1	8.5		8.3
Progression Factor	1.00			1.00		1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	0.1			0.2		0.1	0.5		1.0	2.5		1.3
Delay (s)	7.5			7.6		7.5	8.1		9.1	10.9		9.6
Level of Service	A			A		A	A		A	B		A
Approach Delay (s)		7.5			7.5			8.9			10.1	
Approach LOS		A			A			A			B	
<b>Intersection Summary</b>												
HCM Average Control Delay		9.3			HCM Level of Service			A				
HCM Volume to Capacity ratio		0.21										
Actuated Cycle Length (s)		40.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		41.8%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												



HCM Unsignalized Intersection Capacity Analysis  
 169: University Ave & Front St

10/17/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖		↗
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	300	30	45	25	5	85
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	316	32	47	26	5	89
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)	332					
pX, platoon unblocked						
vC, conflicting volume			347		453	332
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			347		453	332
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		99	87
cM capacity (veh/h)			1212		543	710
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	347	74	95			
Volume Left	0	47	5			
Volume Right	32	0	89			
cSH	1700	1212	698			
Volume to Capacity	0.20	0.04	0.14			
Queue Length 95th (ft)	0	3	12			
Control Delay (s)	0.0	5.3	11.0			
Lane LOS		A	B			
Approach Delay (s)	0.0	5.3	11.0			
Approach LOS			B			
<b>Intersection Summary</b>						
Average Delay			2.8			
Intersection Capacity Utilization			36.9%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 194: Washington St & Fifth Ave

10/17/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	170	1775	430	0	15
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	179	1868	453	0	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (ft)		248	112			
pX, platoon unblocked	0.57				0.57	0.57
vC, conflicting volume	2321				2184	1161
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2566				2325	519
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	94
cM capacity (veh/h)	96				18	284

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	89	89	1246	1075	16
Volume Left	0	0	0	0	0
Volume Right	0	0	0	453	16
cSH	1700	1700	1700	1700	284
Volume to Capacity	0.05	0.05	0.73	0.63	0.06
Queue Length 95th (ft)	0	0	0	0	4
Control Delay (s)	0.0	0.0	0.0	0.0	18.4
Lane LOS					C
Approach Delay (s)	0.0		0.0		18.4
Approach LOS					C

Intersection Summary			
Average Delay		0.1	
Intersection Capacity Utilization		72.8%	ICU Level of Service C
Analysis Period (min)		15	



HCM Signalized Intersection Capacity Analysis  
1: Washington St & First Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0				
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00				
Frbp, ped/bikes	1.00	0.98		1.00	0.99			0.99				
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00				
Frt	1.00	0.99		1.00	0.98			0.96				
Flt Protected	0.95	1.00		0.95	1.00			0.98				
Satd. Flow (prot)	1770	3430		1770	3456			1725				
Flt Permitted	0.08	1.00		0.08	1.00			0.98				
Satd. Flow (perm)	151	3430		154	3456			1725				
Volume (vph)	125	1585	155	140	1275	150	265	145	180	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	1668	163	147	1342	158	279	153	189	0	0	0
RTOR Reduction (vph)	0	7	0	0	9	0	0	16	0	0	0	0
Lane Group Flow (vph)	132	1824	0	147	1491	0	0	605	0	0	0	0
Confl. Peds. (#/hr)			58			32			26			49
Confl. Bikes (#/hr)			19			7			4			6
Turn Type	pm+pt			pm+pt			Perm					
Protected Phases	5	2		1	6			4				
Permitted Phases	2			6			4					
Actuated Green, G (s)	53.0	48.3		51.6	47.6			31.1				
Effective Green, g (s)	54.3	49.2		52.9	48.5			32.0				
Actuated g/C Ratio	0.54	0.49		0.53	0.48			0.32				
Clearance Time (s)	4.4	4.9		4.4	4.9			4.9				
Vehicle Extension (s)	2.0	1.0		2.0	1.0			1.0				
Lane Grp Cap (vph)	165	1688		153	1676			552				
v/s Ratio Prot	0.04	0.53		0.04	0.43							
v/s Ratio Perm	0.39			0.47				0.35				
v/c Ratio	0.80	1.08		0.96	0.89			1.10				
Uniform Delay, d1	39.5	25.4		46.6	23.3			34.0				
Progression Factor	0.88	0.85		0.54	0.30			1.00				
Incremental Delay, d2	17.2	44.7		45.7	4.8			67.4				
Delay (s)	51.8	66.2		70.6	11.9			101.4				
Level of Service	D	E		E	B			F				
Approach Delay (s)		65.3			17.2			101.4			0.0	
Approach LOS		E			B			F			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			51.8				HCM Level of Service		D			
HCM Volume to Capacity ratio			1.05									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			107.6%				ICU Level of Service		G			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
3: Washington St & Fifth Ave

10/17/2013

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↘	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.95
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3539			3539	1770	1507
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3539			3539	1770	1507
Volume (vph)	1990	0	0	1330	525	465
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2095	0	0	1400	553	489
RTOR Reduction (vph)	0	0	0	0	0	5
Lane Group Flow (vph)	2095	0	0	1400	553	484
Confl. Peds. (#/hr)		52				31
Confl. Bikes (#/hr)		14				
Bus Blockages (#/hr)	0	0	17	0	0	0
Turn Type						Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	59.1			59.1	31.6	31.6
Effective Green, g (s)	60.0			60.0	32.0	32.0
Actuated g/C Ratio	0.60			0.60	0.32	0.32
Clearance Time (s)	4.9			4.9	4.4	4.4
Vehicle Extension (s)	1.0			1.0	1.0	1.0
Lane Grp Cap (vph)	2123			2123	566	482
v/s Ratio Prot	c0.59			0.40	0.31	
v/s Ratio Perm						c0.32
v/c Ratio	0.99			0.66	0.98	1.00
Uniform Delay, d1	19.6			13.2	33.6	34.0
Progression Factor	0.40			1.00	1.00	1.00
Incremental Delay, d2	3.6			1.6	31.6	42.1
Delay (s)	11.4			14.9	65.2	76.1
Level of Service	B			B	E	E
Approach Delay (s)	11.4			14.9	70.3	
Approach LOS	B			B	E	
<b>Intersection Summary</b>						
HCM Average Control Delay			26.0		HCM Level of Service	C
HCM Volume to Capacity ratio			0.99			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			93.2%		ICU Level of Service	F
Analysis Period (min)			15			
c Critical Lane Group						



HCM Signalized Intersection Capacity Analysis  
4: Washington St & Goldfinch St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Fr <sub>t</sub>	1.00	0.99		1.00	0.98		1.00	0.90		1.00	0.99	
Fl <sub>t</sub> Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3512		1770	3436		1770	1684		1770	1831	
Fl <sub>t</sub> Permitted	0.95	1.00		0.95	1.00		0.53	1.00		0.64	1.00	
Satd. Flow (perm)	1770	3512		1770	3436		984	1684		1184	1831	
Volume (vph)	245	1125	60	320	1050	145	80	45	80	250	165	15
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	258	1184	63	337	1105	153	84	47	84	263	174	16
RTOR Reduction (vph)	0	4	0	0	12	0	0	63	0	0	4	0
Lane Group Flow (vph)	258	1243	0	337	1246	0	84	68	0	263	186	0
Confl. Peds. (#/hr)						27						27
Confl. Bikes (#/hr)						3						16
Turn Type	Prot		Prot		Perm		Perm					
Protected Phases	5	2	1	6			8				4	
Permitted Phases						8					4	
Actuated Green, G (s)	14.8	35.1		19.2	39.1		22.8	22.8		21.9	21.9	
Effective Green, g (s)	15.2	36.0		19.2	40.0		22.8	22.8		22.8	22.8	
Actuated g/C Ratio	0.17	0.40		0.21	0.44		0.25	0.25		0.25	0.25	
Clearance Time (s)	4.4	4.9		4.0	4.9		4.0	4.0		4.9	4.9	
Vehicle Extension (s)	2.0	3.3		3.0	3.3		3.0	3.0		2.0	2.0	
Lane Grp Cap (vph)	299	1405		378	1527		249	427		300	464	
v/s Ratio Prot	0.15	c0.35		c0.19	c0.36			0.04			0.10	
v/s Ratio Perm							0.09			c0.22		
v/c Ratio	0.86	0.88		0.89	0.82		0.34	0.16		0.88	0.40	
Uniform Delay, d <sub>1</sub>	36.4	25.1		34.4	21.8		27.4	26.1		32.3	27.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d <sub>2</sub>	21.1	8.4		22.2	4.9		0.8	0.2		23.1	0.2	
Delay (s)	57.5	33.5		56.6	26.7		28.2	26.3		55.3	28.1	
Level of Service	E	C		E	C		C	C		E	C	
Approach Delay (s)		37.6			33.0			27.1			43.9	
Approach LOS		D			C			C			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			35.8			HCM Level of Service					D	
HCM Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			85.2%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
5: Washington St & Front St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↓			↑↑			↑↓		↑	↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0		4.0	4.0	4.0
Lane Util. Factor		0.95			0.95			1.00		0.95	0.95	1.00
Frbp, ped/bikes		1.00			1.00			1.00		1.00	1.00	0.95
Flpb, ped/bikes		1.00			1.00			1.00		1.00	1.00	1.00
Frt		1.00			1.00			0.91		1.00	1.00	0.85
Flt Protected		1.00			1.00			0.98		0.95	0.95	1.00
Satd. Flow (prof)		3534			3539			1664		1681	1681	1509
Flt Permitted		1.00			0.95			0.93		0.75	0.75	1.00
Satd. Flow (perm)		3534			3360			1572		1322	1322	1509
Volume (vph)	0	1530	15	5	1485	0	5	0	10	380	0	295
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	102%	100%	100%
Adj. Flow (vph)	0	1611	16	5	1563	0	5	0	11	408	0	311
RTOR Reduction (vph)	0	1	0	0	0	0	0	8	0	0	0	21
Lane Group Flow (vph)	0	1626	0	0	1588	0	0	8	0	204	204	290
Confl. Peds. (#/hr)							36					19
Confl. Bikes (#/hr)							6					16
Turn Type				Perm			Perm			Perm		Perm
Protected Phases		2			6			8			4	
Permitted Phases				6			8			4		4
Actuated Green, G (s)		65.9			65.9			25.2		24.3	24.3	24.3
Effective Green, g (s)		66.8			66.8			25.2		25.2	25.2	25.2
Actuated g/C Ratio		0.67			0.67			0.25		0.25	0.25	0.25
Clearance Time (s)		4.9			4.9			4.0		4.9	4.9	4.9
Vehicle Extension (s)		3.0			3.0			3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		2361			2244			396		333	333	380
v/s Ratio Prot		0.46										
v/s Ratio Perm					0.47			0.00		0.15	0.15	0.19
v/c Ratio		0.69			0.70			0.02		0.61	0.61	0.76
Uniform Delay, d1		10.2			10.3			28.1		33.1	33.1	34.6
Progression Factor		1.00			0.17			1.00		1.00	1.00	1.00
Incremental Delay, d2		1.7			0.8			0.0		3.3	3.3	8.8
Delay (s)		11.9			2.5			28.1		36.4	36.4	43.4
Level of Service		B			A			C		D	D	D
Approach Delay (s)		11.9			2.5			28.1		39.4		
Approach LOS		B			A			C		D		
<b>Intersection Summary</b>												
HCM Average Control Delay			13.2									HCM Level of Service B
HCM Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			100.0									Sum of lost time (s) 8.0
Intersection Capacity Utilization			75.4%									ICU Level of Service D
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
7: Washington St & Fourth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0					4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		0.97	0.95					0.95	0.95	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00					1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00					1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.99					1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00					0.95	0.97	1.00
Satd. Flow (prot)	1770	3464		3433	3471					1681	1715	1537
Flt Permitted	0.95	1.00		0.95	1.00					0.95	0.97	1.00
Satd. Flow (perm)	1770	3464		3433	3471					1681	1715	1537
Volume (vph)	80	1550	160	330	1390	65	0	0	0	675	155	210
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	1632	168	347	1463	68	0	0	0	711	163	221
RTOR Reduction (vph)	0	7	0	0	3	0	0	0	0	0	0	85
Lane Group Flow (vph)	84	1793	0	347	1528	0	0	0	0	425	449	136
Confl. Peds. (#/hr)			43			35						10
Confl. Bikes (#/hr)			10			10			1			10
Bus Blockages (#/hr)	0	0	0	0	4	0	0	0	0	0	0	0
Turn Type	Prot			Prot						Perm		Perm
Protected Phases	5	2		1	6							4
Permitted Phases										4		4
Actuated Green, G (s)	5.3	47.8		10.0	52.5					28.0	28.0	28.0
Effective Green, g (s)	5.7	48.7		10.4	53.4					28.9	28.9	28.9
Actuated g/C Ratio	0.06	0.49		0.10	0.53					0.29	0.29	0.29
Clearance Time (s)	4.4	4.9		4.4	4.9					4.9	4.9	4.9
Vehicle Extension (s)	2.0	0.2		1.0	0.2					1.0	1.0	1.0
Lane Grp Cap (vph)	101	1687		357	1854					486	496	444
v/s Ratio Prot	0.05	c0.52		c0.10	c0.44							
v/s Ratio Perm										0.25	0.26	0.09
v/c Ratio	0.83	1.06		0.97	0.82					0.87	0.91	0.31
Uniform Delay, d1	46.7	25.6		44.7	19.4					33.8	34.2	27.7
Progression Factor	0.78	1.06		1.00	0.85					1.00	1.00	1.00
Incremental Delay, d2	5.2	29.8		34.9	3.5					15.5	19.5	0.1
Delay (s)	41.7	56.9		79.7	20.0					49.3	53.7	27.9
Level of Service	D	E		E	B					D	D	C
Approach Delay (s)		56.2			31.0			0.0			46.8	
Approach LOS		E			C			A			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			44.3	HCM Level of Service				D				
HCM Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			100.0	Sum of lost time (s)				8.0				
Intersection Capacity Utilization			91.3%	ICU Level of Service				F				
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Washington St & SR-163 Off-Ramp

10/17/2013

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR	SWR
Lane Configurations		↑↓		↑↓			↑↓			↑↓		↑↓
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0			4.0			4.0		4.0
Lane Util. Factor		0.95		0.95			1.00			1.00		1.00
Frpb, ped/bikes		0.99		1.00			1.00			1.00		1.00
Flpb, ped/bikes		1.00		1.00			1.00			1.00		1.00
Frft		0.99		1.00			0.97			0.98		0.86
Flt Protected		1.00		1.00			0.97			0.98		1.00
Satd. Flow (prot)		3462		3535			1743			1773		1611
Flt Permitted		0.95		1.00			0.79			0.87		1.00
Satd. Flow (perm)		3302		3535			1431			1573		1611
Volume (vph)	5	2580	270	745	5	140	10	45	15	10	5	590
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	2716	284	784	5	147	11	47	16	11	5	621
RTOR Reduction (vph)	0	6	0	0	0	0	9	0	0	4	0	0
Lane Group Flow (vph)	0	2999	0	789	0	0	196	0	0	28	0	626
Confl. Peds. (#/hr)			18		1							7
Turn Type	Perm				Perm				Perm			custom
Protected Phases		2		6			8			4		5
Permitted Phases	2					8			4			
Actuated Green, G (s)		54.5		54.5			19.1			18.6		32.9
Effective Green, g (s)		55.5		55.5			19.1			19.1		33.4
Actuated g/C Ratio		0.46		0.46			0.16			0.16		0.28
Clearance Time (s)		5.0		5.0			4.0			4.5		4.5
Vehicle Extension (s)		2.0		2.0			0.9			2.0		2.0
Lane Grp Cap (vph)		1527		1635			228			250		448
v/s Ratio Prot				0.22								c0.39
v/s Ratio Perm		c0.91					c0.14			0.02		
v/c Ratio		1.96		0.48			0.86			0.11		1.40
Uniform Delay, d1		32.2		22.3			49.1			43.2		43.3
Progression Factor		1.00		1.40			1.00			1.00		1.00
Incremental Delay, d2		436.0		0.8			25.1			0.1		192.0
Delay (s)		468.3		31.9			74.2			43.3		235.3
Level of Service		F		C			E			D		F
Approach Delay (s)		468.3		31.9			74.2			43.3		
Approach LOS		F		C			E			D		
<b>Intersection Summary</b>												
HCM Average Control Delay			342.8				HCM Level of Service			F		
HCM Volume to Capacity ratio			1.59									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			106.5%				ICU Level of Service			G		
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
 11: Washington St & SR-163 Off-Ramp

10/17/2013



<b>Movement</b>	<b>SWR2</b>
Lane Configurations	
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frbp, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Volume (vph)	5
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	5
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
<b>Intersection Summary</b>	

HCM Signalized Intersection Capacity Analysis  
 14: Normal St & Park Blvd

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↕	↗	↖	↕↕	↗	↖	↕↕	↗	↖	↕↕	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	0.85
Fl t Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1534	1770	3539	1533	1770	3539	1518	1770	3306	1441
Fl t Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1534	1770	3539	1533	1770	3539	1518	1770	3306	1441
Volume (vph)	550	880	130	160	575	60	75	320	230	80	255	215
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	579	926	137	168	605	63	79	337	242	84	268	226
RTOR Reduction (vph)	0	0	87	0	0	38	0	0	0	0	14	129
Lane Group Flow (vph)	579	926	50	168	605	25	79	337	242	84	307	44
Confl. Peds. (#/hr)			5			16			38			
Confl. Bikes (#/hr)			25			16			1			
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Prot
Protected Phases	5	2		1	6		3	8		7	4	4
Permitted Phases			2			6			8			
Actuated Green, G (s)	7.4	33.2	33.2	11.4	36.7	36.7	6.7	25.4	25.4	4.2	22.9	22.9
Effective Green, g (s)	9.3	35.1	35.1	12.8	38.6	38.6	8.1	27.3	27.3	5.6	24.8	24.8
Actuated g/C Ratio	0.10	0.36	0.36	0.13	0.40	0.40	0.08	0.28	0.28	0.06	0.26	0.26
Clearance Time (s)	5.9	5.9	5.9	5.4	5.9	5.9	5.4	5.9	5.9	5.4	5.9	5.9
Vehicle Extension (s)	2.0	4.8	4.8	2.0	3.8	3.8	2.0	3.5	3.5	2.0	3.9	3.9
Lane Grp Cap (vph)	330	1283	556	234	1411	611	148	998	428	102	847	369
v/s Ratio Prot	c0.17	c0.26		0.09	c0.17		0.04	0.10		c0.05	0.09	0.03
v/s Ratio Perm			0.03			0.02			c0.16			
v/c Ratio	1.75	0.72	0.09	0.72	0.43	0.04	0.53	0.34	0.57	0.82	0.36	0.12
Uniform Delay, d1	43.8	26.6	20.3	40.3	21.1	17.8	42.5	27.6	29.7	45.1	29.5	27.6
Progression 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
Incremental Delay, d2	351.8	2.4	0.1	8.4	0.3	0.0	1.8	0.2	1.9	37.7	0.4	0.2
Delay (s)	395.5	29.1	20.5	48.7	21.4	17.8	44.4	27.8	31.5	82.8	29.9	27.8
Level of Service	F	C	C	D	C	B	D	C	C	F	C	C
Approach Delay (s)		157.6			26.6			31.2			37.0	
Approach LOS		F			C			C			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			86.9				HCM Level of Service				F	
HCM Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			96.8				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			82.5%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
15: University Ave & First Ave

10/17/2013

	↖	→	↘	↙	←	↖	↙	↑	↘	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frbp, ped/bikes		0.92			0.90			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.92			0.91			0.97			0.99	
Flt Protected		0.98			0.99			0.99			0.99	
Satd. Flow (prot)		1548			1504			1774			1802	
Flt Permitted		0.82			0.91			0.92			0.86	
Satd. Flow (perm)		1291			1383			1646			1561	
Volume (vph)	70	0	115	50	25	165	65	350	105	55	215	30
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	0	121	53	26	174	68	368	111	58	226	32
RTOR Reduction (vph)	0	68	0	0	98	0	0	20	0	0	9	0
Lane Group Flow (vph)	0	127	0	0	155	0	0	527	0	0	307	0
Confl. Peds. (#/hr)			37			52			34			51
Confl. Bikes (#/hr)			50			50						
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		23.2			23.2			22.0			22.0	
Effective Green, g (s)		24.1			24.1			22.9			22.9	
Actuated g/C Ratio		0.44			0.44			0.42			0.42	
Clearance Time (s)		4.9			4.9			4.9			4.9	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		566			606			685			650	
v/s Ratio Prot												
v/s Ratio Perm		0.10			0.11			0.32			0.20	
v/c Ratio		0.22			0.26			0.77			0.47	
Uniform Delay, d1		9.6			9.8			13.8			11.7	
Progression Factor		1.00			2.79			1.00			1.00	
Incremental Delay, d2		0.9			1.0			4.7			0.2	
Delay (s)		10.5			28.3			18.5			11.9	
Level of Service		B			C			B			B	
Approach Delay (s)		10.5			28.3			18.5			11.9	
Approach LOS		B			C			B			B	
<b>Intersection Summary</b>												
HCM Average Control Delay			17.6				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			55.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			62.9%				ICU Level of Service				B	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
16: University Ave & Fourth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔						↔↔	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0						4.0	
Lane Util. Factor		1.00		1.00	1.00						0.95	
Frpb, ped/bikes		0.92		1.00	1.00						1.00	
Flpb, ped/bikes		1.00		1.00	1.00						1.00	
Frt		0.91		1.00	1.00						1.00	
Flt Protected		1.00		0.95	1.00						0.99	
Satd. Flow (prot)		1556		1770	1833						3503	
Flt Permitted		1.00		0.70	1.00						0.99	
Satd. Flow (perm)		1556		1308	1833						3503	
Volume (vph)	0	25	55	245	225	0	0	0	0	120	455	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	26	58	258	237	0	0	0	0	126	479	0
RTOR Reduction (vph)	0	27	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	57	0	258	237	0	0	0	0	0	605	0
Confl. Peds. (#/hr)			47			49			21			55
Confl. Bikes (#/hr)			50			50			50			
Bus Blockages (#/hr)	0	0	0	0	4	0	0	0	0	0	0	0
Turn Type				pm+pt							Perm	
Protected Phases		2		1	6							4
Permitted Phases				6						4		
Actuated Green, G (s)		58.4		73.3	72.8						23.3	
Effective Green, g (s)		59.3		73.7	73.7						24.2	
Actuated g/C Ratio		0.54		0.67	0.67						0.22	
Clearance Time (s)		4.9		4.4	4.9						4.9	
Vehicle Extension (s)		2.0		3.0	2.0						2.0	
Lane Grp Cap (vph)		839		920	1228						771	
v/s Ratio Prot		0.04		c0.03	0.13							
v/s Ratio Perm				c0.16							0.17	
v/c Ratio		0.07		0.28	0.19						0.78	
Uniform Delay, d1		12.1		7.5	6.9						40.4	
Progression Factor		1.55		1.11	0.97						1.00	
Incremental Delay, d2		0.1		0.1	0.0						4.9	
Delay (s)		19.0		8.4	6.7						45.3	
Level of Service		B		A	A						D	
Approach Delay (s)		19.0			7.6			0.0			45.3	
Approach LOS		B			A			A			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			27.7			HCM Level of Service					C	
HCM Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)			12.1			
Intersection Capacity Utilization			46.3%			ICU Level of Service					A	
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
17: University Ave & Fifth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↕↔			↕↔				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			0.95			0.95				
Frpb, ped/bikes		1.00			0.89			0.91				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.94			0.95				
Flt Protected		0.99			1.00			1.00				
Satd. Flow (prot)		1846			2952			3052				
Flt Permitted		0.65			1.00			1.00				
Satd. Flow (perm)		1203			2952			3052				
Volume (vph)	55	255	0	0	545	360	80	635	370	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	58	268	0	0	574	379	84	668	389	0	0	0
RTOR Reduction (vph)	0	0	0	0	91	0	0	64	0	0	0	0
Lane Group Flow (vph)	0	326	0	0	862	0	0	1077	0	0	0	0
Confl. Peds. (#/hr)			134			136			97			91
Confl. Bikes (#/hr)			50			50						50
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4				
Permitted Phases	2						4					
Actuated Green, G (s)		51.3			51.3			40.8				
Effective Green, g (s)		52.2			52.2			41.7				
Actuated g/C Ratio		0.47			0.47			0.38				
Clearance Time (s)		4.9			4.9			4.9				
Vehicle Extension (s)		1.0			1.0			1.0				
Lane Grp Cap (vph)		571			1401			1157				
v/s Ratio Prot					0.29							
v/s Ratio Perm		0.27						0.35				
v/c Ratio		0.57			0.62			0.93				
Uniform Delay, d1		20.8			21.4			32.8				
Progression Factor		0.70			0.93			1.00				
Incremental Delay, d2		4.0			1.7			12.9				
Delay (s)		18.6			21.7			45.7				
Level of Service		B			C			D				
Approach Delay (s)		18.6			21.7			45.7			0.0	
Approach LOS		B			C			D			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			32.6					HCM Level of Service			C	
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			110.0					Sum of lost time (s)			12.3	
Intersection Capacity Utilization			94.7%					ICU Level of Service			F	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
18: University Ave & Sixth Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	1.00		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Flpb, ped/bikes	1.00	0.92		1.00	0.92		1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flt	1.00	0.95		1.00	0.94		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	1547		1770	3071		1770	3470		1770	3539	1521
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	1547		1770	3071		1770	3470		1770	3539	1521
Volume (vph)	385	100	55	175	335	235	45	985	120	340	820	490
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	405	105	58	184	353	247	47	1037	126	358	863	516
RTOR Reduction (vph)	0	18	0	0	117	0	0	8	0	0	0	66
Lane Group Flow (vph)	405	145	0	184	483	0	47	1155	0	358	863	450
Confl. Peds. (#/hr)			115			121			16			34
Confl. Bikes (#/hr)			50			50						
Bus Blockages (#/hr)	0	12	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	5	2		1	6		3	8		7		4
Permitted Phases												4
Actuated Green, G (s)	10.6	26.1		13.7	29.2		5.3	31.6		19.5	45.8	56.4
Effective Green, g (s)	11.0	27.0		14.1	30.1		5.7	33.0		19.9	47.2	58.2
Actuated g/C Ratio	0.10	0.25		0.13	0.27		0.05	0.30		0.18	0.43	0.53
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	5.4		4.4	5.4	4.4
Vehicle Extension (s)	3.0	2.2		2.0	2.2		2.0	3.8		2.0	3.8	3.0
Lane Grp Cap (vph)	343	380		227	840		92	1041		320	1519	805
v/s Ratio Prot	c0.12	0.09		c0.10	c0.16		0.03	c0.33		c0.20	0.24	0.06
v/s Ratio Perm												0.24
v/c Ratio	1.18	0.38		0.81	0.58		0.51	1.11		1.12	0.57	0.56
Uniform Delay, d1	49.5	34.5		46.7	34.4		50.8	38.5		45.0	23.7	17.3
Progression Factor	1.13	1.19		1.19	0.99		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	97.3	1.6		17.9	2.8		2.0	62.8		86.3	0.6	0.8
Delay (s)	153.1	42.7		73.3	36.8		52.8	101.3		131.3	24.3	18.2
Level of Service	F	D		E	D		D	F		F	C	B
Approach Delay (s)		121.4			45.4			99.5			44.5	
Approach LOS		F			D			F			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			70.3	HCM Level of Service				E				
HCM Volume to Capacity ratio			0.97									
Actuated Cycle Length (s)			110.0	Sum of lost time (s)				16.0				
Intersection Capacity Utilization			97.7%	ICU Level of Service				F				
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis

19: University Ave & Seventh Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frbp, ped/bikes		0.95			0.98			0.97			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.98			0.99			0.93			0.95	
Flt Protected		1.00			0.99			0.98			0.98	
Satd. Flow (prot)		3207			3366			1656			1715	
Flt Permitted		0.87			0.79			0.78			0.66	
Satd. Flow (perm)		2796			2673			1309			1163	
Volume (vph)	45	505	75	70	470	30	65	30	95	50	25	50
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	47	532	79	74	495	32	68	32	100	53	26	53
RTOR Reduction (vph)	0	4	0	0	2	0	0	48	0	0	32	0
Lane Group Flow (vph)	0	654	0	0	599	0	0	152	0	0	100	0
Confl. Peds. (#/hr)			116			87			35			4
Confl. Bikes (#/hr)			50			50						
Bus Blockages (#/hr)	0	12	0	0	9	0	0	0	0	0	0	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		84.5			84.5			15.7			15.7	
Effective Green, g (s)		85.4			85.4			16.6			16.6	
Actuated g/C Ratio		0.78			0.78			0.15			0.15	
Clearance Time (s)		4.9			4.9			4.9			4.9	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		2171			2075			198			176	
v/s Ratio Prot												
v/s Ratio Perm		0.23			0.22			0.12			0.09	
v/c Ratio		0.30			0.29			0.77			0.57	
Uniform Delay, d1		3.6			3.5			44.9			43.4	
Progression Factor		0.52			0.07			1.00			1.00	
Incremental Delay, d2		0.1			0.3			14.9			2.5	
Delay (s)		2.0			0.5			59.8			45.8	
Level of Service		A			A			E			D	
Approach Delay (s)		2.0			0.5			59.8			45.8	
Approach LOS		A			A			E			D	

Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
20: University Ave & Eighth St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frbp, ped/bikes		0.98			0.99			0.94			0.96	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.98			0.98			0.94			0.96	
Flt Protected		1.00			1.00			1.00			0.97	
Satd. Flow (prot)		3293			3424			1627			1652	
Flt Permitted		0.91			0.78			0.97			0.72	
Satd. Flow (perm)		2992			2664			1590			1226	
Volume (vph)	25	680	120	60	640	115	10	60	65	160	5	80
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	716	126	63	674	121	11	63	68	168	5	84
RTOR Reduction (vph)	0	11	0	0	10	0	0	32	0	0	17	0
Lane Group Flow (vph)	0	857	0	0	848	0	0	110	0	0	240	0
Confl. Peds. (#/hr)			38						70			65
Confl. Bikes (#/hr)			50			50						
Bus Blockages (#/hr)	0	12	0	0	0	0	0	0	0	0	0	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			3			4	
Permitted Phases	2			2			3			4		
Actuated Green, G (s)		54.4			54.4			14.3			23.6	
Effective Green, g (s)		56.3			56.3			16.2			25.5	
Actuated g/C Ratio		0.51			0.51			0.15			0.23	
Clearance Time (s)		5.9			5.9			5.9			5.9	
Vehicle Extension (s)		1.0			1.0			2.0			2.0	
Lane Grp Cap (vph)		1531			1363			234			284	
v/s Ratio Prot												
v/s Ratio Perm		0.29			0.32			0.07			0.20	
v/c Ratio		0.56			0.62			0.47			0.85	
Uniform Delay, d1		18.4			19.2			43.0			40.4	
Progression Factor		0.87			0.67			1.00			1.00	
Incremental Delay, d2		1.4			2.1			0.5			19.3	
Delay (s)		17.4			15.0			43.5			59.7	
Level of Service		B			B			D			E	
Approach Delay (s)		17.4			15.0			43.5			59.7	
Approach LOS		B			B			D			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.3					HCM Level of Service			C	
HCM Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			110.0					Sum of lost time (s)		12.0		
Intersection Capacity Utilization			91.1%					ICU Level of Service		F		
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis

21: University Ave & Ninth St

10/17/2013

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Lane Configurations		↕↕	↕↕		↗	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		0.95	0.95		1.00	1.00
Frbp, ped/bikes		1.00	0.99		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3534	3407		1770	1539
Flt Permitted		0.92	1.00		0.95	1.00
Satd. Flow (perm)		3269	3407		1770	1539
Volume (vph)	20	665	645	20	355	145
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	700	679	21	374	153
RTOR Reduction (vph)	0	0	1	0	0	65
Lane Group Flow (vph)	0	721	699	0	374	88
Confl. Peds. (#/hr)				94		10
Confl. Bikes (#/hr)				50		
Bus Blockages (#/hr)	0	0	12	0	0	0
Turn Type	Perm				Perm	
Protected Phases		2	6		4	
Permitted Phases	2					4
Actuated Green, G (s)		74.6	74.6		26.1	26.1
Effective Green, g (s)		75.5	75.5		26.5	26.5
Actuated g/C Ratio		0.69	0.69		0.24	0.24
Clearance Time (s)		4.9	4.9		4.4	4.4
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2244	2338		426	371
v/s Ratio Prot			0.21		0.21	
v/s Ratio Perm		0.22				0.06
v/c Ratio		0.32	0.30		0.88	0.24
Uniform Delay, d1		6.9	6.8		40.2	33.6
Progression Factor		0.32	0.84		1.00	1.00
Incremental Delay, d2		0.3	0.1		18.1	0.3
Delay (s)		2.5	5.8		58.3	34.0
Level of Service		A	A		E	C
Approach Delay (s)		2.5	5.8		51.2	
Approach LOS		A	A		D	
<b>Intersection Summary</b>						
HCM Average Control Delay			16.9		HCM Level of Service	B
HCM Volume to Capacity ratio			0.47			
Actuated Cycle Length (s)			110.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			59.2%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

22: University Ave & Tenth St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.95		1.00	0.98		1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.93		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	3139		1770	3451		1770	1695		1770	1713	
Flt Permitted	0.95	1.00		0.95	1.00		0.44	1.00		0.60	1.00	
Satd. Flow (perm)	1787	3139		1770	3451		813	1695		1117	1713	
Volume (vph)	150	630	185	115	480	25	95	60	50	30	95	75
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	158	663	195	121	505	26	100	63	53	32	100	79
RTOR Reduction (vph)	0	19	0	0	2	0	0	33	0	0	32	0
Lane Group Flow (vph)	158	839	0	121	529	0	100	83	0	32	147	0
Confl. Peds. (#/hr)			69			102			35			19
Confl. Bikes (#/hr)			50			50						
Heavy Vehicles (%)	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	17	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot		Prot		Perm		Perm		Perm		Perm	
Protected Phases	5	2		1	6			8				4
Permitted Phases							8				4	
Actuated Green, G (s)	13.5	58.3		19.6	64.4		17.9	17.9		17.9	17.9	
Effective Green, g (s)	13.9	59.2		20.0	65.3		18.8	18.8		18.8	18.8	
Actuated g/C Ratio	0.13	0.54		0.18	0.59		0.17	0.17		0.17	0.17	
Clearance Time (s)	4.4	4.9		4.4	4.9		4.9	4.9		4.9	4.9	
Vehicle Extension (s)	2.0	5.3		2.0	3.4		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	226	1689		322	2049		139	290		191	293	
v/s Ratio Prot	c0.09	c0.27		c0.07	0.15			0.05			0.09	
v/s Ratio Perm							c0.12			0.03		
v/c Ratio	0.70	0.50		0.38	0.26		0.72	0.29		0.17	0.50	
Uniform Delay, d1	46.0	16.0		39.5	10.7		43.1	39.7		38.9	41.4	
Progression Factor	1.01	0.81		0.78	0.43		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.5	0.9		0.3	0.3		13.8	0.2		0.2	0.5	
Delay (s)	53.0	13.9		31.0	4.9		56.9	39.9		39.1	41.9	
Level of Service	D	B		C	A		E	D		D	D	
Approach Delay (s)		20.0			9.7			47.8			41.4	
Approach LOS		C			A			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			21.8			HCM Level of Service		C				
HCM Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)		12.0				
Intersection Capacity Utilization			69.0%			ICU Level of Service		C				
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis

23: University Ave & Vermont St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖		↖	↖↗	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.96		1.00	0.98		1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.98		1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1593	3124		1593	2898		1593	1551		1593	1676	1325
Flt Permitted	0.95	1.00		0.95	1.00		0.62	1.00		0.67	1.00	1.00
Satd. Flow (perm)	1593	3124		1593	2898		1035	1551		1128	1676	1325
Volume (vph)	80	570	35	45	425	85	10	55	35	100	115	130
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	600	37	47	447	89	11	58	37	105	121	137
RTOR Reduction (vph)	0	2	0	0	10	0	0	27	0	0	0	107
Lane Group Flow (vph)	84	635	0	47	526	0	11	68	0	105	121	30
Confl. Peds. (#/hr)			46			86			34			56
Confl. Bikes (#/hr)			50			50						
Bus Blockages (#/hr)	0	0	0	0	12	0	0	0	0	0	0	0
Turn Type	Prot			Prot			Perm			Perm		Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		4
Actuated Green, G (s)	11.1	67.1		5.5	61.5		23.2	23.2		23.2	23.2	23.2
Effective Green, g (s)	11.5	68.0		5.9	62.4		24.1	24.1		24.1	24.1	24.1
Actuated g/C Ratio	0.10	0.62		0.05	0.57		0.22	0.22		0.22	0.22	0.22
Clearance Time (s)	4.4	4.9		4.4	4.9		4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)	2.0	3.2		2.0	3.4		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	167	1931		85	1644		227	340		247	367	290
v/s Ratio Prot	c0.05	c0.20		0.03	0.18			0.04			0.07	
v/s Ratio Perm							0.01			c0.09		0.02
v/c Ratio	0.50	0.33		0.55	0.32		0.05	0.20		0.43	0.33	0.10
Uniform Delay, d1	46.5	10.1		50.8	12.6		33.9	35.1		37.0	36.2	34.3
Progression Factor	0.93	0.21		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.8	0.4		4.4	0.5		0.1	0.3		1.2	0.5	0.2
Delay (s)	44.0	2.6		55.1	13.1		34.0	35.4		38.2	36.7	34.5
Level of Service	D	A		E	B		C	D		D	D	C
Approach Delay (s)		7.4			16.5			35.2			36.3	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM Average Control Delay	18.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
24: University Ave & Richmond St

10/17/2013

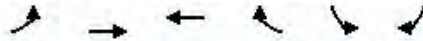
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖↗		↖	↖↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.98		1.00	0.97		1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.94		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3327		1770	3274		1770	1713		1770	1764	
Flt Permitted	0.95	1.00		0.95	1.00		0.39	1.00		0.62	1.00	
Satd. Flow (perm)	1770	3327		1770	3274		734	1713		1154	1764	
Volume (vph)	150	525	45	65	430	80	45	85	65	90	210	80
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	158	553	47	68	453	84	47	89	68	95	221	84
RTOR Reduction (vph)	0	6	0	0	16	0	0	48	0	0	24	0
Lane Group Flow (vph)	158	594	0	68	521	0	47	109	0	95	281	0
Confl. Peds. (#/hr)			127			69			43			52
Confl. Bikes (#/hr)			50			50						
Bus Blockages (#/hr)	0	13	0	0	12	0	0	0	0	0	0	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	5	2		1	6			8				4
Permitted Phases							8				4	
Actuated Green, G (s)	11.6	37.9		5.0	31.3		22.9	22.9		22.9	22.9	
Effective Green, g (s)	12.0	38.8		5.4	32.2		23.8	23.8		23.8	23.8	
Actuated g/C Ratio	0.15	0.48		0.07	0.40		0.30	0.30		0.30	0.30	
Clearance Time (s)	4.4	4.9		4.4	4.9		4.9	4.9		4.9	4.9	
Vehicle Extension (s)	2.0	3.2		2.0	3.1		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	266	1614		119	1318		218	510		343	525	
v/s Ratio Prot	c0.09	c0.18		0.04	0.16			0.06			c0.16	
v/s Ratio Perm							0.06			0.08		
v/c Ratio	0.59	0.37		0.57	0.40		0.22	0.21		0.28	0.54	
Uniform Delay, d1	31.7	12.9		36.2	17.0		21.1	21.1		21.5	23.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.4	0.6		4.1	0.9		0.2	0.1		0.2	0.5	
Delay (s)	34.1	13.6		40.2	17.9		21.3	21.2		21.7	24.0	
Level of Service	C	B		D	B		C	C		C	C	
Approach Delay (s)		17.8			20.4			21.2			23.5	
Approach LOS		B			C			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			20.1			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.45									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			74.7%			ICU Level of Service			D			
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
25: University Ave & Normal St

10/17/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↗	↖		↖	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00		1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	3432		1770	1506
Flt Permitted	0.41	1.00	1.00		0.95	1.00
Satd. Flow (perm)	767	3539	3432		1770	1506
Volume (vph)	55	715	530	40	165	50
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	58	753	558	42	174	53
RTOR Reduction (vph)	0	0	4	0	0	39
Lane Group Flow (vph)	58	753	596	0	174	14
Confl. Peds. (#/hr)				58		75
Confl. Bikes (#/hr)				50		
Bus Blockages (#/hr)	0	0	8	0	0	0
Turn Type	Perm				Perm	
Protected Phases		2	6		4	
Permitted Phases	2					4
Actuated Green, G (s)	35.6	35.6	35.6		15.7	15.7
Effective Green, g (s)	36.5	36.5	36.5		16.1	16.1
Actuated g/C Ratio	0.60	0.60	0.60		0.27	0.27
Clearance Time (s)	4.9	4.9	4.9		4.4	4.4
Vehicle Extension (s)	4.8	4.8	3.9		2.0	2.0
Lane Grp Cap (vph)	462	2132	2067		470	400
v/s Ratio Prot		c0.21	0.17		c0.10	
v/s Ratio Perm	0.08					0.01
v/c Ratio	0.13	0.35	0.29		0.37	0.04
Uniform Delay, d1	5.2	6.1	5.8		18.1	16.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	0.2	0.1		0.2	0.0
Delay (s)	5.4	6.3	5.9		18.3	16.5
Level of Service	A	A	A		B	B
Approach Delay (s)		6.2	5.9		17.9	
Approach LOS		A	A		B	

Intersection Summary			
HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	60.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
26: University Ave & Park Blvd

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.97		1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3286		1770	3404		1770	3333		1770	3539	1471
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3286		1770	3404		1770	3333		1770	3539	1471
Volume (vph)	100	420	125	85	345	85	130	405	175	180	350	80
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	105	442	132	89	363	89	137	426	184	189	368	84
RTOR Reduction (vph)	0	30	0	0	23	0	0	48	0	0	0	58
Lane Group Flow (vph)	105	544	0	89	429	0	137	562	0	189	368	26
Confl. Peds. (#/hr)			68			42			43			60
Confl. Bikes (#/hr)			8			8			8			8
Bus Blockages (#/hr)	0	12	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot			Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												4
Actuated Green, G (s)	5.1	23.4		6.6	24.9		9.4	26.1		7.3	24.0	24.0
Effective Green, g (s)	5.5	24.3		7.0	25.8		9.8	27.0		7.7	24.9	24.9
Actuated g/C Ratio	0.07	0.30		0.09	0.31		0.12	0.33		0.09	0.30	0.30
Clearance Time (s)	4.4	4.9		4.4	4.9		4.4	4.9		4.4	4.9	4.9
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	3.3		2.0	2.9	2.9
Lane Grp Cap (vph)	119	974		151	1071		212	1097		166	1075	447
v/s Ratio Prot	c0.06	c0.17		0.05	0.13		0.08	c0.17		c0.11	0.10	
v/s Ratio Perm												0.02
v/c Ratio	0.88	0.56		0.59	0.40		0.65	0.51		1.14	0.34	0.06
Uniform Delay, d1	37.9	24.3		36.1	22.0		34.4	22.2		37.1	22.2	20.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	48.1	0.4		5.8	0.1		6.6	0.4		112.0	0.2	0.1
Delay (s)	86.0	24.7		41.9	22.1		41.1	22.6		149.1	22.4	20.3
Level of Service	F	C		D	C		D	C		F	C	C
Approach Delay (s)		34.2			25.4			26.0			59.5	
Approach LOS		C			C			C			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			36.2				HCM Level of Service				D	
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			82.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			83.6%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
27: Washington St & SR-163 On-Ramp

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			1%			0%	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0			4.0			
Lane Util. Factor	1.00	0.91	1.00		0.91	0.91			1.00			
Flpb, ped/bikes	1.00	1.00	0.98		1.00	0.99			1.00			
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00			1.00			
Frt	1.00	1.00	0.85		0.95	0.85			0.86			
Flt Protected	0.95	1.00	1.00		1.00	1.00			1.00			
Satd. Flow (prot)	1770	5085	1544		3197	1422			1603			
Flt Permitted	0.95	1.00	1.00		1.00	1.00			1.00			
Satd. Flow (perm)	1770	5085	1544		3197	1422			1603			
Volume (vph)	780	2525	550	0	655	830	0	0	25	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	821	2658	579	0	689	874	0	0	26	0	0	0
RTOR Reduction (vph)	0	0	0	0	48	86	0	0	0	0	0	0
Lane Group Flow (vph)	821	2658	579	0	1014	415	0	0	26	0	0	0
Confl. Peds. (#/hr)			1									1
Confl. Bikes (#/hr)			11			2						
Turn Type	Prot		Perm			Perm						custom
Protected Phases	5	2				6						
Permitted Phases			2			6						2
Actuated Green, G (s)	58.7	120.0	120.0		52.0	52.0			120.0			
Effective Green, g (s)	59.1	120.0	120.0		52.9	52.9			120.0			
Actuated g/C Ratio	0.49	1.00	1.00		0.44	0.44			1.00			
Clearance Time (s)	4.4	2.0	2.0		4.9	4.9			2.0			
Vehicle Extension (s)	2.0	3.0	3.0		2.8	2.8			3.0			
Lane Grp Cap (vph)	872	5085	1544		1409	627			1603			
v/s Ratio Prot	0.46	0.52			0.32							
v/s Ratio Perm			0.37			0.29			0.02			
v/c Ratio	0.94	0.52	0.38		0.72	0.66			0.02			
Uniform Delay, d1	28.8	0.0	0.0		27.5	26.5			0.0			
Progression Factor	0.70	1.00	1.00		0.17	0.25			1.00			
Incremental Delay, d2	2.4	0.0	0.1		0.3	0.5			0.0			
Delay (s)	22.5	0.0	0.1		4.9	7.3			0.0			
Level of Service	C	A	A		A	A			A			
Approach Delay (s)		4.6			5.7			0.0			0.0	
Approach LOS		A			A			A			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			4.9	HCM Level of Service				A				
HCM Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			120.0	Sum of lost time (s)				8.0				
Intersection Capacity Utilization			84.1%	ICU Level of Service				E				
Analysis Period (min)			15									

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
28: Washington St & Lincoln Ave

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗↔			↗↔		↘	↗			↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	0.91			0.91		1.00	1.00			1.00	1.00
Frbp, ped/bikes	1.00	0.99			1.00		1.00	0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.98			1.00		1.00	0.99			1.00	0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1770	4930			5081		1770	1825			1850	1583
Flt Permitted	0.95	1.00			1.00		0.95	1.00			0.99	1.00
Satd. Flow (perm)	1770	4930			5081		1770	1825			1850	1583
Volume (vph)	260	1945	380	0	1140	5	345	45	5	5	30	145
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	274	2047	400	0	1200	5	363	47	5	5	32	153
RTOR Reduction (vph)	0	14	0	0	0	0	0	4	0	0	0	143
Lane Group Flow (vph)	274	2433	0	0	1205	0	363	48	0	0	37	10
Confl. Peds. (#/hr)			6				4		19			
Confl. Bikes (#/hr)			7				3					1
Turn Type	Prot						Split			Split		Prot
Protected Phases	5	2			6		3	3		4	4	4
Permitted Phases												
Actuated Green, G (s)	38.4	74.2			31.3		12.1	12.1			7.0	7.0
Effective Green, g (s)	38.8	75.1			32.3		13.0	13.0			7.9	7.9
Actuated g/C Ratio	0.32	0.63			0.27		0.11	0.11			0.07	0.07
Clearance Time (s)	4.4	4.9			5.0		4.9	4.9			4.9	4.9
Vehicle Extension (s)	2.0	5.7			6.0		3.0	3.0			2.0	2.0
Lane Grp Cap (vph)	572	3085			1368		192	198			122	104
v/s Ratio Prot	0.15	c0.49			c0.24		c0.21	0.03			c0.02	0.01
v/s Ratio Perm												
v/c Ratio	0.48	0.79			0.88		1.89	0.24			0.30	0.10
Uniform Delay, d1	32.5	16.6			42.0		53.5	49.0			53.4	52.7
Progression Factor	0.50	1.37			1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	0.2	1.9			7.8		419.8	0.6			0.5	0.1
Delay (s)	16.6	24.7			49.8		473.3	49.6			53.9	52.8
Level of Service	B	C			D		F	D			D	D
Approach Delay (s)		23.8			49.8			420.2			53.1	
Approach LOS		C			D			F			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			68.3				HCM Level of Service				E	
HCM Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)				28.0	
Intersection Capacity Utilization			78.6%				ICU Level of Service				D	
Analysis Period (min)			15									
c Critical Lane Group												



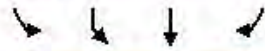
HCM Signalized Intersection Capacity Analysis  
32: Robinson Ave & Park Blvd

10/17/2013

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	NBR2
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0					4.0			4.0		
Lane Util. Factor	1.00	1.00					1.00			0.95		
Frbp, ped/bikes	1.00	0.98					0.99			1.00		
Flpb, ped/bikes	1.00	1.00					1.00			1.00		
Frnt	1.00	0.94					0.97			0.99		
Flt Protected	0.95	1.00					0.99			0.99		
Satd. Flow (prot)	1770	1712					1790			3472		
Flt Permitted	0.69	1.00					0.92			0.80		
Satd. Flow (perm)	1291	1712					1664			2798		
Volume (vph)	100	170	30	85	5	20	115	35	135	615	35	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	105	179	32	89	5	21	121	37	142	647	37	5
RTOR Reduction (vph)	0	29	0	0	0	0	17	0	0	0	0	0
Lane Group Flow (vph)	105	271	0	0	0	0	167	0	0	831	0	0
Confl. Peds. (#/hr)			24					23			18	
Confl. Bikes (#/hr)			9					2			22	
Turn Type	Perm				Perm		Perm			Perm		
Protected Phases	4				8		8			2		
Permitted Phases	4				8		8			2		
Actuated Green, G (s)	11.8	11.8					11.8			20.8		
Effective Green, g (s)	12.7	12.7					12.7			21.7		
Actuated g/C Ratio	0.30	0.30					0.30			0.51		
Clearance Time (s)	4.9	4.9					4.9			4.9		
Vehicle Extension (s)	2.0	2.0					2.0			3.5		
Lane Grp Cap (vph)	387	513					498			1432		
v/s Ratio Prot	c0.16											
v/s Ratio Perm	0.08						0.10			c0.30		
v/c Ratio	0.27	0.53					0.34			0.58		
Uniform Delay, d1	11.3	12.4					11.6			7.2		
Progression Factor	1.00	1.00					1.00			1.00		
Incremental Delay, d2	0.1	0.5					0.1			0.6		
Delay (s)	11.5	12.8					11.7			7.8		
Level of Service	B	B					B			A		
Approach Delay (s)	12.5						11.7			7.8		
Approach LOS	B						B			A		
<b>Intersection Summary</b>												
HCM Average Control Delay	8.6						HCM Level of Service		A			
HCM Volume to Capacity ratio	0.56											
Actuated Cycle Length (s)	42.4						Sum of lost time (s)		8.0			
Intersection Capacity Utilization	82.1%						ICU Level of Service		E			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
 32: Robinson Ave & Park Blvd

10/17/2013



Movement	SBL2	SBL	SBT	SBR
Lane Configurations		↔	↔	
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	
Lane Util. Factor		1.00	0.95	
Frpb, ped/bikes		1.00	0.99	
Flpb, ped/bikes		1.00	1.00	
Fr t		1.00	0.98	
Fl t Protected		0.95	1.00	
Satd. Flow (prot)		1770	3431	
Fl t Permitted		0.30	1.00	
Satd. Flow (perm)		554	3431	
Volume (vph)	30	35	360	65
Peak-hour factor, PHF	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	37	379	68
RTOR Reduction (vph)	0	0	20	0
Lane Group Flow (vph)	0	69	427	0
Confl. Peds. (#/hr)				35
Confl. Bikes (#/hr)				8
Turn Type	Perm	Perm		
Protected Phases			6	
Permitted Phases	6	6		
Actuated Green, G (s)		20.8	20.8	
Effective Green, g (s)		21.7	21.7	
Actuated g/C Ratio		0.51	0.51	
Clearance Time (s)		4.9	4.9	
Vehicle Extension (s)		3.5	3.5	
Lane Grp Cap (vph)		284	1756	
v/s Ratio Prot			0.12	
v/s Ratio Perm		0.12		
v/c Ratio		0.24	0.24	
Uniform Delay, d1		5.8	5.8	
Progression Factor		1.00	1.00	
Incremental Delay, d2		0.5	0.1	
Delay (s)		6.3	5.9	
Level of Service		A	A	
Approach Delay (s)			5.9	
Approach LOS			A	
<b>Intersection Summary</b>				



HCM Signalized Intersection Capacity Analysis  
40: University Ave & Goldfinch St

10/17/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Fr <sub>t</sub>	1.00	0.87		1.00	1.00		1.00	0.93		1.00	0.99	
Fl <sub>t</sub> Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1617		1770	1863		1770	1734		1770	1845	
Fl <sub>t</sub> Permitted	0.74	1.00		0.73	1.00		0.51	1.00		0.59	1.00	
Satd. Flow (perm)	1379	1617		1359	1863		951	1734		1104	1845	
Volume (vph)	20	5	35	65	25	0	40	135	115	135	295	20
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	5	37	68	26	0	42	142	121	142	311	21
RTOR Reduction (vph)	0	22	0	0	0	0	0	73	0	0	6	0
Lane Group Flow (vph)	21	20	0	68	26	0	42	190	0	142	326	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.0	16.0		16.0	16.0		16.0	16.0		16.0	16.0	
Effective Green, g (s)	16.0	16.0		16.0	16.0		16.0	16.0		16.0	16.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.40		0.40	0.40	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	552	647		544	745		380	694		442	738	
v/s Ratio Prot		0.01			0.01			0.11			c0.18	
v/s Ratio Perm	0.02			c0.05			0.04			0.13		
v/c Ratio	0.04	0.03		0.12	0.03		0.11	0.27		0.32	0.44	
Uniform Delay, d <sub>1</sub>	7.3	7.3		7.6	7.3		7.5	8.1		8.3	8.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d <sub>2</sub>	0.1	0.1		0.5	0.1		0.6	1.0		1.9	1.9	
Delay (s)	7.4	7.4		8.1	7.4		8.1	9.1		10.2	10.7	
Level of Service	A	A		A	A		A	A		B	B	
Approach Delay (s)		7.4			7.9			8.9			10.5	
Approach LOS		A			A			A			B	
<b>Intersection Summary</b>												
HCM Average Control Delay			9.5				HCM Level of Service			A		
HCM Volume to Capacity ratio			0.28									
Actuated Cycle Length (s)			40.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			41.9%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

