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Appendix J HCM Sensitivity Analysis – PM Peak



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Priority Growth Areas Mobility Study

Vistro File: Z:\...\Z0016285 PGA Sensitivity Analysis.vistro
Report File: Z:\...\PM Sensitivity Analysis +10% Volume.pdf

Scenario 7 +10% PM
2025-04-24

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
3	104 Avenue and 109 Street	Signalized	HCM 7th Edition	NB Left	0.939	137.0	F
17	Stony Plain Road and 149 Street	Signalized	HCM 7th Edition	WB Thru	0.791	78.3	E
21	95 Avenue and 156 Street	Signalized	HCM 7th Edition	NB Left	0.708	58.3	E
26	109 Street and 87 Ave	Signalized	HCM 7th Edition	SB Thru	1.083	230.6	F
29	114 Street and 82 Ave	Signalized	HCM 7th Edition	SB Thru	0.748	94.9	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 3: 104 Avenue and 109 Street

Control Type:	Signalized	Delay (sec / veh):	137.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.939

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.66	3.60	3.60
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	0	0	1
Entry Pocket Length [m]	100.00	30.48	30.48	100.00	30.48	30.48	70.00	30.48	30.48	30.48	30.48	55.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	180	1536	28	158	1401	172	152	372	110	0	759	438
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	3	0	0	17	0	0	11	0	0	44
Total Hourly Volume [veh/h]	180	1536	28	158	1401	172	152	372	110	0	759	438
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	45	384	7	40	350	43	38	93	28	0	190	110
Total Analysis Volume [veh/h]	180	1536	28	158	1401	172	152	372	110	0	759	438
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	50			50			50			50		
v_di, Inbound Pedestrian Volume crossing m	50			50			50			50		
v_co, Outbound Pedestrian Volume crossing	50			50			50			50		
v_ci, Inbound Pedestrian Volume crossing mi	50			50			50			50		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	160
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	3	4	0	3	4	0	1	5	0	0	2	0
Auxiliary Signal Groups												
Maximum Green [s]	17	43	0	17	43	0	13	69	0	0	50	0
Amber [s]	4.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	3.0	3.0	0.0	3.0	3.0	0.0	2.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	25	0	0	25	0	0	25	0
Delayed Vehicle Green [s]	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	5.0	5.0	0.0	5.0	5.0	0.0	4.0	5.0	0.0	0.0	5.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering 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

Phasing & Timing: Pattern 1

Split [s]	23	60	0	23	60	0	20	77	0	0	57	0
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	0	10	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No	No		No	No		No	No			No	
Maximum Recall	Yes	Yes		Yes	Yes		Yes	Yes			Yes	
Pedestrian Recall	No	Yes		No	Yes		No	Yes			Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	C	R
C, Calculated Cycle Length [s]	160	160	160	160	160	160	160	160	160	160	160
L, Total Lost Time per Cycle [s]	7.00	7.00	7.00	7.00	7.00	7.00	6.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	5.00	5.00	5.00	5.00	5.00	5.00	4.00	5.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	16	48	48	16	48	48	14	65	65	45	45
g / C, Green / Cycle	0.10	0.30	0.30	0.10	0.30	0.30	0.09	0.41	0.41	0.28	0.28
(v / s)_i Volume / Saturation Flow Rate	0.12	0.35	0.35	0.11	0.36	0.37	0.10	0.15	0.16	0.26	0.34
s, saturation flow rate [veh/h]	1476	2951	1526	1476	2951	1408	1476	1683	1492	2951	1278
c, Capacity [veh/h]	148	885	458	148	885	422	129	684	606	830	359
d1, Uniform Delay [s]	72.00	56.00	56.00	72.00	56.00	56.00	73.00	33.11	33.41	55.64	55.20
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	144.85	85.21	97.66	94.05	95.31	125.59	134.41	1.51	1.83	16.28	121.07
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.22	1.16	1.17	1.07	1.19	1.24	1.18	0.36	0.38	0.91	1.22
d, Delay for Lane Group [s/veh]	216.85	141.21	153.66	166.05	151.31	181.59	207.41	34.62	35.24	71.91	176.26
Lane Group LOS	F	F	F	F	F	F	F	C	D	E	F
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	12.02	28.30	30.84	9.94	29.54	31.73	10.15	7.16	6.77	16.70	26.01
50th-Percentile Queue Length [m/ln]	91.60	215.65	235.00	75.72	225.11	241.81	77.33	54.54	51.57	127.24	198.22
95th-Percentile Queue Length [veh/ln]	19.05	40.57	43.98	15.52	42.63	46.41	16.29	11.55	11.03	23.40	38.47
95th-Percentile Queue Length [m/ln]	145.20	309.18	335.15	118.25	324.86	353.67	124.11	87.98	84.09	178.31	293.17

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	216.85	145.32	153.66	166.05	158.88	181.59	207.41	34.82	35.24	0.00	71.91	176.26
Movement LOS	F	F	F	F	F	F	F	C	D		E	F
d_A, Approach Delay [s/veh]	152.84			161.79			76.27			110.10		
Approach LOS	F			F			E			F		
d_I, Intersection Delay [s/veh]	136.97											
Intersection LOS	F											
Intersection V/C	0.939											

Emissions

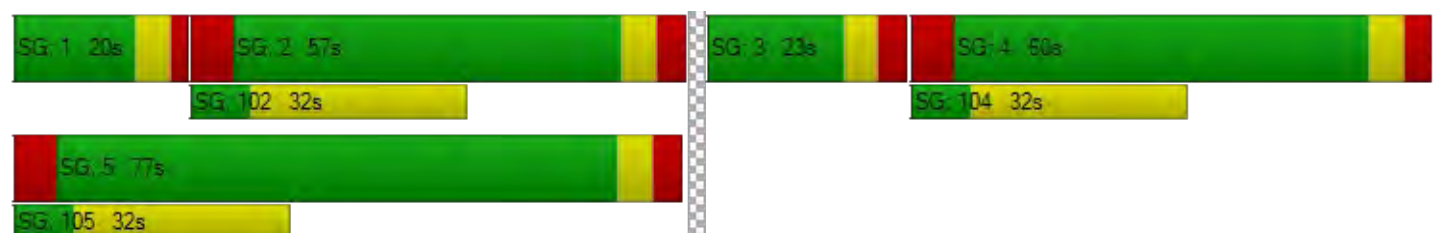
Vehicle Kilometers Traveled [km/h]	80.37	459.24	239.08	33.33	221.62	110.21	39.20	64.35	59.95	174.67	100.80
Stops [stops/h]	270.46	1273.51	693.91	223.58	1329.39	714.00	228.35	161.05	152.29	751.42	585.31
Fuel consumption [L/h]	43.78	184.12	101.68	28.39	173.33	99.57	33.13	16.39	15.43	75.51	82.18
CO [g/h]	808.35	3399.98	1877.63	524.29	3200.63	1838.59	611.80	302.62	284.94	1394.42	1517.48
NOx [g/h]	157.27	661.51	365.32	102.01	622.73	357.72	119.03	58.88	55.44	271.30	295.25
VOC [g/h]	187.34	787.98	435.16	121.51	741.78	426.11	141.79	70.14	66.04	323.17	351.69

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0			11.0			11.0			11.0		
M_corner, Corner Circulation Area [m²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	7.44			1.67			6.65			9.06		
d_p, Pedestrian Delay [s]	69.38			69.38			69.38			69.38		
I_p,int, Pedestrian LOS Score for Intersectio	3.097			3.211			2.701			2.754		
Crosswalk LOS	C			C			B			C		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	600			600			813			563		
d_b, Bicycle Delay [s]	39.20			39.20			28.20			41.33		
I_b,int, Bicycle LOS Score for Intersection	2.520			2.521			2.092			2.583		
Bicycle LOS	B			B			B			B		

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 17: Stony Plain Road and 149 Street

Control Type:	Signalized	Delay (sec / veh):	78.3
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.791

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
No. of Lanes in Entry Pocket	1	0	0	1	0	1	1	0	1	1	0	1
Entry Pocket Length [m]	90.00	30.48	30.48	65.00	30.48	75.00	50.00	30.48	0.00	110.00	30.48	75.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	60.00			60.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	53	696	442	37	1059	89	109	281	256	274	678	106
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	44	0	0	9	0	0	26	0	0	11
Total Hourly Volume [veh/h]	53	696	442	37	1059	89	109	281	256	274	678	106
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	13	174	111	9	265	22	27	70	64	69	170	27
Total Analysis Volume [veh/h]	53	696	442	37	1059	89	109	281	256	274	678	106
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	10			10			10			10		
v_di, Inbound Pedestrian Volume crossing m	10			10			10			10		
v_co, Outbound Pedestrian Volume crossing	10			10			10			10		
v_ci, Inbound Pedestrian Volume crossing mi	10			10			10			10		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	92.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	5	7	0	5	7	0	1	3	0	1	3	0
Auxiliary Signal Groups												
Maximum Green [s]	7	34	0	7	34	0	12	22	0	12	22	0
Amber [s]	4.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	30	0	0	30	0	0	19	0	0	19	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	5.0	0.0	2.0	5.0	0.0	5.0	5.0	0.0	5.0	5.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering 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

Phasing & Timing: Pattern 1

Split [s]	9	44	0	9	44	0	14	33	0	14	33	0
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Pedestrian Recall	No	Yes		No	Yes		No	Yes		No	Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Calculated Cycle Length [s]	100	100	100	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	7.00	7.00	4.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	5.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	46	37	37	46	37	37	7	26	26	7	26	26
g / C, Green / Cycle	0.46	0.37	0.37	0.46	0.37	0.37	0.07	0.26	0.26	0.07	0.26	0.26
(v / s)_i Volume / Saturation Flow Rate	0.08	0.21	0.28	0.06	0.32	0.06	0.07	0.15	0.16	0.09	0.36	0.07
s, saturation flow rate [veh/h]	665	3279	1589	669	3279	1547	1640	1870	1589	3186	1870	1589
c, Capacity [veh/h]	263	1213	588	329	1213	572	115	486	413	223	486	413
d1, Uniform Delay [s]	20.13	25.19	27.49	16.47	29.31	21.02	46.32	32.22	32.64	46.50	37.00	29.34
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering 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
d2, Incremental Delay [s]	1.71	1.98	8.60	0.69	8.82	0.58	71.21	4.94	6.82	135.81	189.77	1.50
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, 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

Lane Group Results

X, volume / capacity	0.20	0.57	0.75	0.11	0.87	0.16	0.95	0.58	0.62	1.23	1.39	0.26
d, Delay for Lane Group [s/veh]	21.84	27.17	36.09	17.17	38.13	21.60	117.54	37.16	39.45	182.31	226.77	30.83
Lane Group LOS	C	C	D	B	D	C	F	D	D	F	F	C
Critical Lane Group	Yes	No	No	No	Yes	No	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	0.77	6.64	10.15	0.51	12.66	1.44	4.95	6.50	6.16	6.95	37.21	2.17
50th-Percentile Queue Length [m/ln]	5.87	50.63	77.35	3.88	96.46	10.96	37.68	49.49	46.94	52.97	283.52	16.56
95th-Percentile Queue Length [veh/ln]	1.39	10.87	15.38	0.92	18.49	2.59	8.59	10.67	10.23	11.99	56.01	3.91
95th-Percentile Queue Length [m/ln]	10.57	82.84	117.17	6.99	140.92	19.73	65.47	81.34	77.96	91.38	426.77	29.81

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	21.84	27.17	36.09	17.17	38.13	21.60	117.54	37.16	39.45	182.31	226.77	30.83
Movement LOS	C	C	D	B	D	C	F	D	D	F	F	C
d_A, Approach Delay [s/veh]	30.24			36.23			51.63			195.62		
Approach LOS	C			D			D			F		
d_I, Intersection Delay [s/veh]	78.25											
Intersection LOS	E											
Intersection V/C	0.791											

Emissions

Vehicle Kilometers Traveled [km/h]	13.31	174.81	111.02	7.73	221.18	18.59	25.95	66.89	60.94	98.73	244.31	38.20
Stops [stops/h]	27.75	478.35	365.44	18.34	911.40	51.80	178.03	233.83	221.77	500.52	1339.48	78.24
Fuel consumption [L/h]	2.95	45.22	33.75	1.75	79.78	4.77	16.33	19.65	18.55	59.10	171.71	7.91
CO [g/h]	54.40	835.05	623.16	32.39	1473.21	88.10	301.54	362.91	342.59	1091.23	3170.66	146.00
NOx [g/h]	10.58	162.47	121.24	6.30	286.63	17.14	58.67	70.61	66.66	212.31	616.89	28.41
VOC [g/h]	12.61	193.53	144.42	7.51	341.43	20.42	69.88	84.11	79.40	252.90	734.83	33.84

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0			11.0			11.0			11.0		
M_corner, Corner Circulation Area [m²/ped]	0.00			93.10			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	47.94			62.27			66.36			36.89		
d_p, Pedestrian Delay [s]	39.61			39.61			39.61			39.61		
I_p,int, Pedestrian LOS Score for Intersectio	2.970			2.898			2.523			2.661		
Crosswalk LOS	C			C			B			B		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	740			740			520			520		
d_b, Bicycle Delay [s]	19.85			19.85			27.38			27.38		
I_b,int, Bicycle LOS Score for Intersection	2.578			2.545			2.668			3.323		
Bicycle LOS	B			B			B			C		

Sequence

Ring 1	1	3	5	7	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 21: 95 Avenue and 156 Street

Control Type:	Signalized	Delay (sec / veh):	58.3
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.708

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	0
Entry Pocket Length [m]	75.00	30.48	30.48	75.00	30.48	30.48	30.48	30.48	30.48	30.48	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	114	292	113	71	469	70	78	449	66	85	482	11
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	11	0	0	7	0	0	7	0	0	1
Total Hourly Volume [veh/h]	114	292	113	71	469	70	78	449	66	85	482	11
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	73	28	18	117	18	20	112	17	21	121	3
Total Analysis Volume [veh/h]	114	292	113	71	469	70	78	449	66	85	482	11
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	20			20			20			20		
v_di, Inbound Pedestrian Volume crossing m	20			20			20			20		
v_co, Outbound Pedestrian Volume crossing	20			20			20			20		
v_ci, Inbound Pedestrian Volume crossing mi	20			20			20			20		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	1	3	0	1	3	0	5	7	0	5	7	0
Auxiliary Signal Groups												
Maximum Green [s]	14	28	0	14	28	0	10	40	0	10	40	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	29	0	0	29	0	0	30	0	0	30	0
Delayed Vehicle Green [s]	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	3.0	0.0	3.0	3.0	0.0	1.0	3.0	0.0	1.0	3.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering 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

Phasing & Timing: Pattern 1

Split [s]	14	48	0	14	48	0	8	50	0	8	50	0
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Pedestrian Recall	No	Yes		No	Yes		No	Yes		No	Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	3.00	3.00	0.00	3.00	0.00	3.00
g_i, Effective Green Time [s]	9	38	9	38	53	40	53	40
g / C, Green / Cycle	0.08	0.32	0.08	0.32	0.44	0.33	0.44	0.33
(v / s)_i Volume / Saturation Flow Rate	0.07	0.23	0.04	0.30	0.07	0.31	0.08	0.29
s, saturation flow rate [veh/h]	1640	1761	1640	1817	1057	1669	1042	1713
c, Capacity [veh/h]	123	558	123	576	310	556	284	571
d1, Uniform Delay [s]	55.17	36.39	53.66	39.83	24.41	38.57	25.61	37.44
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	63.33	8.05	18.22	24.74	1.93	23.66	2.68	15.86
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.93	0.73	0.58	0.94	0.25	0.93	0.30	0.86
d, Delay for Lane Group [s/veh]	118.50	44.44	71.88	64.57	26.34	62.24	28.29	53.30
Lane Group LOS	F	D	E	E	C	E	C	D
Critical Lane Group	Yes	No	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	5.58	11.69	2.69	19.16	1.45	18.03	1.62	15.87
50th-Percentile Queue Length [m/ln]	42.54	89.04	20.52	146.01	11.05	137.35	12.32	120.91
95th-Percentile Queue Length [veh/ln]	9.46	17.29	4.85	26.34	2.61	24.99	2.91	22.40
95th-Percentile Queue Length [m/ln]	72.06	131.76	36.94	200.71	19.90	190.41	22.18	170.70

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	118.50	44.44	44.44	71.88	64.57	64.57	26.34	62.24	62.24	28.29	53.30	53.30
Movement LOS	F	D	D	E	E	E	C	E	E	C	D	D
d_A, Approach Delay [s/veh]	60.70			65.42			57.51			49.62		
Approach LOS	E			E			E			D		
d_I, Intersection Delay [s/veh]	58.35											
Intersection LOS	E											
Intersection V/C	0.708											

Emissions

Vehicle Kilometers Traveled [km/h]	28.81	102.35	24.07	182.75	22.31	147.33	29.23	169.52
Stops [stops/h]	167.47	350.55	80.80	574.84	43.52	540.76	48.52	476.04
Fuel consumption [L/h]	16.90	31.46	8.03	57.09	4.68	50.84	5.72	47.05
CO [g/h]	312.12	580.99	148.35	1054.17	86.45	938.70	105.65	868.77
NOx [g/h]	60.73	113.04	28.86	205.10	16.82	182.64	20.56	169.03
VOC [g/h]	72.34	134.65	34.38	244.31	20.04	217.55	24.48	201.35

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [m²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	25.49	28.68	23.46	20.20
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
I_p,int, Pedestrian LOS Score for Intersectio	2.401	2.339	2.476	2.455
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	633	633	667	667
d_b, Bicycle Delay [s]	28.02	28.02	26.67	26.67
I_b,int, Bicycle LOS Score for Intersection	2.434	2.578	2.550	2.515
Bicycle LOS	B	B	B	B

Sequence

Ring 1	1	3	5	7	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 26: 109 Street and 87 Ave

Control Type:	Signalized	Delay (sec / veh):	230.6
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.083

Intersection Setup

Name	109 Street				109 Street				87 Ave			
Approach	Northbound				Southbound				Eastbound			
Lane Configuration												
Turning Movement	Left	Thru	Thru	Right	Left	Left	Thru	Right	Left	Left	Thru	Right
Lane Width [m]	3.20	3.66	3.20	4.00	3.66	3.66	3.60	4.50	3.50	3.50	3.50	3.50
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	1
Entry Pocket Length [m]	80.00	30.48	30.48	35.00	30.48	30.48	30.48	30.48	30.48	30.48	30.48	45.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00				50.00				50.00			
Grade [%]	0.00				0.00				0.00			
Curb Present	Yes				Yes				Yes			
Crosswalk	Yes				Yes				Yes			

Volumes

Name	109 Street				109 Street				87 Ave			
Base Volume Input [veh/h]	350	806	0	9	0	0	1835	175	532	0	72	243
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	1	0	0	0	18	0	0	0	24
Total Hourly Volume [veh/h]	350	806	0	8	0	0	1835	157	532	0	72	219
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	88	202	0	2	0	0	459	39	133	0	18	55
Total Analysis Volume [veh/h]	350	806	0	8	0	0	1835	157	532	0	72	219
Presence of On-Street Parking	No			No	No			No	No			No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	106				0				51			
v_di, Inbound Pedestrian Volume crossing th	105				0				51			
v_co, Outbound Pedestrian Volume along th	41				51				105			
v_ci, Inbound Pedestrian Volume along the l	40				51				106			
v_ab, Corner Pedestrian Volume [ped/h]	0				0				0			
Bicycle Volume [bicycles/h]	19				25				9			

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	110
Active Pattern	Pattern 2
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	3.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Overlap	Overlap	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	1	0	3	0	0	1	0	0	0	3	2
Auxiliary Signal Groups	1,2	1,2		1,3								
Maximum Green [s]	30	59	0	26	0	0	59	0	0	0	26	30
Amber [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
All red [s]	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	2.0
Walk [s]	0	8	0	7	0	0	8	0	0	0	7	0
Pedestrian Clearance [s]	0	16	0	19	0	0	16	0	0	0	19	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk												
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering 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

Phasing & Timing: Pattern 2

Split [s]	12	43	0	25	0	0	43	0	0	0	25	12
Lead / Lag	Lag	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	24	0	20	0	0	24	0	0	0	20	5
Vehicle Extension [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
Minimum Recall	No	Yes		No			Yes				No	
Maximum Recall	Yes	No		No			No				No	
Pedestrian Recall	No	No		Yes			No				Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	4
Pedestrian Walk [s]	7
Pedestrian Clearance [s]	23

Lane Group Calculations

Lane Group	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	110	110	110	110	110	110	110	110
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	3.00	3.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	50	50	75	38	38	20	20	20
g / C, Green / Cycle	0.46	0.46	0.68	0.35	0.35	0.18	0.18	0.18
(v / s)_i Volume / Saturation Flow Rate	0.78	0.25	0.01	0.59	0.59	0.25	0.31	0.16
s, saturation flow rate [veh/h]	448	3204	1456	1683	1688	1086	1053	1398
c, Capacity [veh/h]	240	1458	992	582	584	243	250	254
d1, Uniform Delay [s]	45.39	21.83	5.58	35.98	35.98	48.42	48.10	43.47
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.47	0.50	0.18
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	227.03	1.51	0.01	327.20	324.92	94.27	169.46	13.25
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.46	0.55	0.01	1.71	1.71	1.13	1.32	0.86
d, Delay for Lane Group [s/veh]	272.41	23.34	5.60	363.18	360.90	142.70	217.56	56.73
Lane Group LOS	F	C	A	F	F	F	F	E
Critical Lane Group	Yes	No	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	19.03	7.69	0.06	68.09	67.92	13.09	18.66	6.64
50th-Percentile Queue Length [m/ln]	145.03	58.62	0.45	518.81	517.54	99.74	142.19	50.61
95th-Percentile Queue Length [veh/ln]	32.12	12.24	0.11	106.21	105.88	20.15	29.14	10.87
95th-Percentile Queue Length [m/ln]	244.79	93.28	0.80	809.29	806.83	153.56	222.07	82.82

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	272.41	23.34	0.00	5.60	0.00	0.00	362.13	360.90	178.50	0.00	217.56	56.73
Movement LOS	F	C		A			F	F	F		F	E
d_A, Approach Delay [s/veh]	98.11				362.04				149.83			
Approach LOS	F				F				F			
d_I, Intersection Delay [s/veh]	230.56											
Intersection LOS	F											
Intersection V/C	1.083											

Emissions

Vehicle Kilometers Traveled [km/h]	36.98	85.15	0.85	103.13	103.13	54.10	65.10	43.22
Stops [stops/h]	622.89	503.55	1.92	2228.24	2222.79	428.36	610.70	217.37
Fuel consumption [L/h]	90.92	33.89	0.16	338.38	336.51	44.88	75.17	18.56
CO [g/h]	1678.92	625.80	2.92	6248.36	6213.87	828.81	1387.99	342.68
NOx [g/h]	326.66	121.76	0.57	1215.70	1208.99	161.26	270.05	66.67
VOC [g/h]	389.11	145.03	0.68	1448.12	1440.12	192.09	321.68	79.42

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0				11.0				11.0			
M_corner, Corner Circulation Area [m²/ped]	8.37				54.68				0.00			
M_CW, Crosswalk Circulation Area [m²/ped]	3.92				0.00				5.82			
d_p, Pedestrian Delay [s]	44.55				44.55				44.55			
I_p,int, Pedestrian LOS Score for Intersectio	3.103				2.765				2.614			
Crosswalk LOS	C				C				B			
s_b, Saturation Flow Rate of the bicycle lane	2000				2000				2000			
c_b, Capacity of the bicycle lane [bicycles/h]	909				691				364			
d_b, Bicycle Delay [s]	16.52				23.86				36.98			
I_b,int, Bicycle LOS Score for Intersection	2.521				3.218				2.957			
Bicycle LOS	B				C				C			

Intersection Setup

Name	87 Ave							
Approach	Westbound				Southwestbound			
Lane Configuration								
Turning Movement	Left	Thru	Right	Right	Left	Thru	Right	Right
Lane Width [m]	3.50	3.66	3.50	3.66	3.66	3.66	3.66	3.66
No. of Lanes in Entry Pocket	0	0	0	1	0	0	0	0
Entry Pocket Length [m]	30.48	30.48	30.48	10.00	30.48	30.48	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	30.00				50.00			
Grade [%]	0.00				0.00			
Curb Present	Yes							
Crosswalk	Yes				Yes			

Volumes

Name	87 Ave							
Base Volume Input [veh/h]	59	0	0	197	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00							
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	20	0	0	0	0
Total Hourly Volume [veh/h]	59	0	0	177	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	15	0	0	44	0	0	0	0
Total Analysis Volume [veh/h]	59	0	0	177	0	0	0	0
Presence of On-Street Parking	No			No				
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	40				0			
v_di, Inbound Pedestrian Volume crossing th	41				0			
v_co, Outbound Pedestrian Volume along th	0				0			
v_ci, Inbound Pedestrian Volume along the l	0				0			
v_ab, Corner Pedestrian Volume [ped/h]	0				0			
Bicycle Volume [bicycles/h]	0				0			

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	110
Active Pattern	Pattern 2
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	3.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	3	0	0	0	0	0	0	0
Auxiliary Signal Groups								
Maximum Green [s]	26	0	0	0	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All red [s]	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Walk [s]	7	0	0	0	0	0	0	0
Pedestrian Clearance [s]	19	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk								
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 2

Split [s]	25	0	0	0	0	0	0	0
Lead / Lag	Lag	-	-	-	-	-	-	-
Minimum Green [s]	20	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	No							
Maximum Recall	No							
Pedestrian Recall	Yes							

Exclusive Pedestrian Phase

Pedestrian Signal Group	4
Pedestrian Walk [s]	7
Pedestrian Clearance [s]	23

Lane Group Calculations

Lane Group	L	R	
C, Calculated Cycle Length [s]	110	110	
L, Total Lost Time per Cycle [s]	5.00	5.00	
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	
l2, Clearance Lost Time [s]	3.00	3.00	
g_i, Effective Green Time [s]	20	20	
g / C, Green / Cycle	0.18	0.18	
(v / s)_i Volume / Saturation Flow Rate	0.06	0.12	
s, saturation flow rate [veh/h]	979	1431	
c, Capacity [veh/h]	65	260	
d1, Uniform Delay [s]	55.00	42.02	
k, delay calibration	0.11	0.11	
l, Upstream Filtering Factor	1.00	1.00	
d2, Incremental Delay [s]	31.69	3.12	
d3, Initial Queue Delay [s]	0.00	0.00	
Rp, platoon ratio	1.00	1.00	
PF, progression factor	1.00	1.00	

Lane Group Results

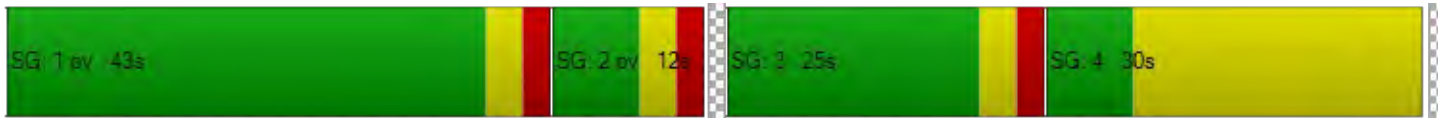
X, volume / capacity	0.90	0.68	
d, Delay for Lane Group [s/veh]	86.69	45.13	
Lane Group LOS	F	D	
Critical Lane Group	No	No	
50th-Percentile Queue Length [veh/ln]	2.24	4.80	
50th-Percentile Queue Length [m/ln]	17.06	36.55	
95th-Percentile Queue Length [veh/ln]	4.03	8.39	
95th-Percentile Queue Length [m/ln]	30.71	63.91	

Movement, Approach, & Intersection Results								
d_M, Delay for Movement [s/veh]	86.69	0.00	0.00	45.13	0.00	0.00	0.00	0.00
Movement LOS	F			D				
d_A, Approach Delay [s/veh]	55.52				0.00			
Approach LOS	E				A			
d_I, Intersection Delay [s/veh]	230.56							
Intersection LOS	F							
Intersection V/C	1.083							

Emissions			
Vehicle Kilometers Traveled [km/h]	2.14	6.43	
Stops [stops/h]	73.27	156.96	
Fuel consumption [L/h]	4.79	8.19	
CO [g/h]	88.40	151.23	
NOx [g/h]	17.20	29.42	
VOC [g/h]	20.49	35.05	

Other Modes		
g_Walk,mi, Effective Walk Time [s]	11.0	11.0
M_corner, Corner Circulation Area [m²/ped]	0.00	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	14.11	0.00
d_p, Pedestrian Delay [s]	44.55	44.55
I_p,int, Pedestrian LOS Score for Intersectio	2.046	3.296
Crosswalk LOS	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	364	0
d_b, Bicycle Delay [s]	36.82	55.00
I_b,int, Bicycle LOS Score for Intersection	1.560	4.132
Bicycle LOS	A	D

Sequence																
Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 29: 114 Street and 82 Ave

Control Type:	Signalized	Delay (sec / veh):	94.9
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.748

Intersection Setup

Name	114 Street			114 Street			University Ave			82 Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.50	3.70	3.60	3.66	3.60	3.60	4.00	3.60	3.60	3.66	3.66	3.66
No. of Lanes in Entry Pocket	2	0	1	0	0	1	1	0	1	2	0	0
Entry Pocket Length [m]	170.00	30.48	2.00	30.48	30.48	105.00	95.00	30.48	95.00	100.00	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	114 Street			114 Street			University Ave			82 Ave		
Base Volume Input [veh/h]	624	314	251	0	966	33	19	277	739	289	278	16
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	25	0	0	3	0	0	0	0	0	2
Total Hourly Volume [veh/h]	624	314	226	0	966	33	19	277	739	289	278	16
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	156	79	57	0	242	8	5	69	185	72	70	4
Total Analysis Volume [veh/h]	624	314	226	0	966	33	19	277	739	289	278	16
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	4			2			3			2		
v_di, Inbound Pedestrian Volume crossing m	3			2			4			2		
v_co, Outbound Pedestrian Volume crossing	13			0			0			13		
v_ci, Inbound Pedestrian Volume crossing mi	13			0			0			13		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	142
Active Pattern	Pattern 2
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Overlap	Permiss	Permiss	Permiss	Overlap	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss
Signal Group	2	1	0	0	1	2	3	6	2	5	4	0
Auxiliary Signal Groups		1,2				1,2			2,6			
Maximum Green [s]	38	33	0	0	33	38	10	38	38	16	38	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0
All red [s]	3.0	3.0	0.0	0.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0	0.0
Walk [s]	0	9	0	0	9	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	24	0	0	24	0	0	22	0	0	22	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.0	4.0	0.0	0.0	4.0	4.0	5.0	5.0	4.0	5.0	5.0	0.0
Detector Location [m]	1.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	0.0
Detector Length [m]	5.0	5.0	0.0	0.0	5.0	5.0	5.0	0.0	0.0	5.0	5.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering 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

Phasing & Timing: Pattern 2

Split [s]	35	55	0	0	55	35	17	36	35	17	36	0
Lead / Lag	Lag	-	-	-	-	-	Lead	-	-	Lag	-	-
Minimum Green [s]	10	27	0	0	27	10	7	29	10	7	29	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0
Minimum Recall	No	Yes			Yes	No	No	No	No	No	No	
Maximum Recall	No	No			No	No	No	Yes	No	No	Yes	
Pedestrian Recall	No	No			No	No	No	No	No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	C	R	L	C	R	L	C	C
C, Calculated Cycle Length [s]	151	151	151	151	151	151	151	151	151	151	151
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	7.00	7.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	0.00	4.00	4.00	0.00	5.00	5.00	0.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	38	77	33	33	77	4	38	82	16	50	50
g / C, Green / Cycle	0.25	0.51	0.22	0.22	0.51	0.03	0.25	0.54	0.10	0.33	0.33
(v / s)_i Volume / Saturation Flow Rate	0.26	0.10	0.16	0.30	0.03	0.01	0.09	0.32	0.09	0.10	0.10
s, saturation flow rate [veh/h]	2404	3204	1431	3204	1318	1535	2951	2325	3113	1550	1520
c, Capacity [veh/h]	619	1636	313	701	673	40	744	1264	326	513	503
d1, Uniform Delay [s]	58.85	20.02	54.62	58.88	18.52	72.45	46.54	22.98	66.60	37.30	37.31
k, delay calibration	0.11	0.11	0.22	0.20	0.11	0.11	0.50	0.16	0.11	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	18.78	0.06	6.27	173.39	0.03	8.77	1.43	0.65	8.03	1.42	1.45
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.01	0.19	0.72	1.38	0.05	0.48	0.37	0.58	0.89	0.29	0.29
d, Delay for Lane Group [s/veh]	77.64	20.08	60.89	232.27	18.55	81.21	47.97	23.63	74.63	38.72	38.76
Lane Group LOS	F	C	E	F	B	F	D	C	E	D	D
Critical Lane Group	Yes	No	No	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	13.67	3.07	8.54	30.27	0.60	0.83	4.49	8.87	5.87	4.31	4.25
50th-Percentile Queue Length [m/ln]	104.18	23.40	65.08	230.62	4.57	6.29	34.20	67.57	44.72	32.85	32.37
95th-Percentile Queue Length [veh/ln]	19.83	5.53	13.33	45.85	1.08	1.49	7.96	13.75	9.84	7.72	7.63
95th-Percentile Queue Length [m/ln]	151.10	42.13	101.60	349.37	8.23	11.32	60.68	104.79	75.00	58.80	58.13

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	77.64	20.08	60.89	0.00	232.27	18.55	81.21	47.97	23.63	74.63	38.74	38.76
Movement LOS	F	C	E		F	B	F	D	C	E	D	D
d_A, Approach Delay [s/veh]	58.86			225.21			31.20			56.53		
Approach LOS	E			F			C			E		
d_I, Intersection Delay [s/veh]	94.88											
Intersection LOS	F											
Intersection V/C	0.748											

Emissions

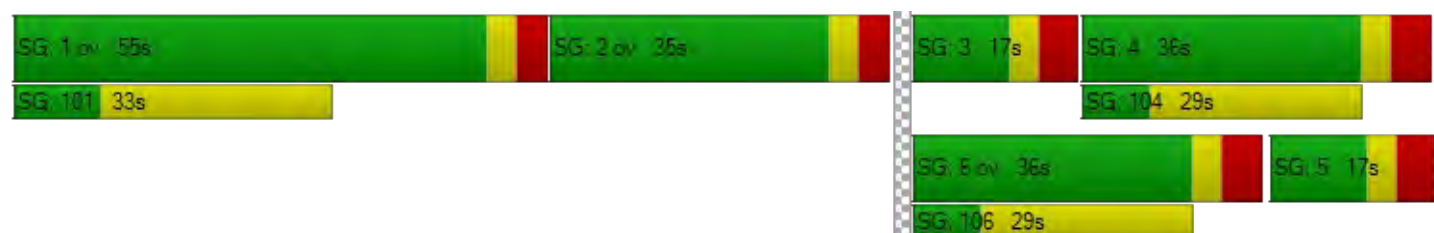
Vehicle Kilometers Traveled [km/h]	176.63	88.88	63.97	223.29	7.63	6.25	91.08	242.98	47.95	24.58	24.19
Stops [stops/h]	652.80	146.64	203.89	1445.04	14.33	19.70	214.30	423.39	280.23	102.93	101.42
Fuel consumption [L/h]	68.76	16.60	21.26	226.46	1.52	2.22	23.71	46.07	27.46	9.07	8.93
CO [g/h]	1269.74	306.58	392.58	4181.79	28.05	41.08	437.76	850.66	507.05	167.43	164.91
NOx [g/h]	247.05	59.65	76.38	813.62	5.46	7.99	85.17	165.51	98.65	32.57	32.08
VOC [g/h]	294.27	71.05	90.98	969.17	6.50	9.52	101.46	197.15	117.51	38.80	38.22

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0			11.0			13.0			13.0		
M_corner, Corner Circulation Area [m²/ped]	25.12			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	0.00			246.03			0.00			27.69		
d_p, Pedestrian Delay [s]	64.80			64.80			62.96			62.96		
I_p,int, Pedestrian LOS Score for Intersectio	3.001			2.602			3.790			2.666		
Crosswalk LOS	C			B			D			B		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1114			650			385			385		
d_b, Bicycle Delay [s]	14.80			34.36			49.19			49.19		
I_b,int, Bicycle LOS Score for Intersection	2.541			2.386			2.413			2.042		
Bicycle LOS	B			B			B			B		

Sequence

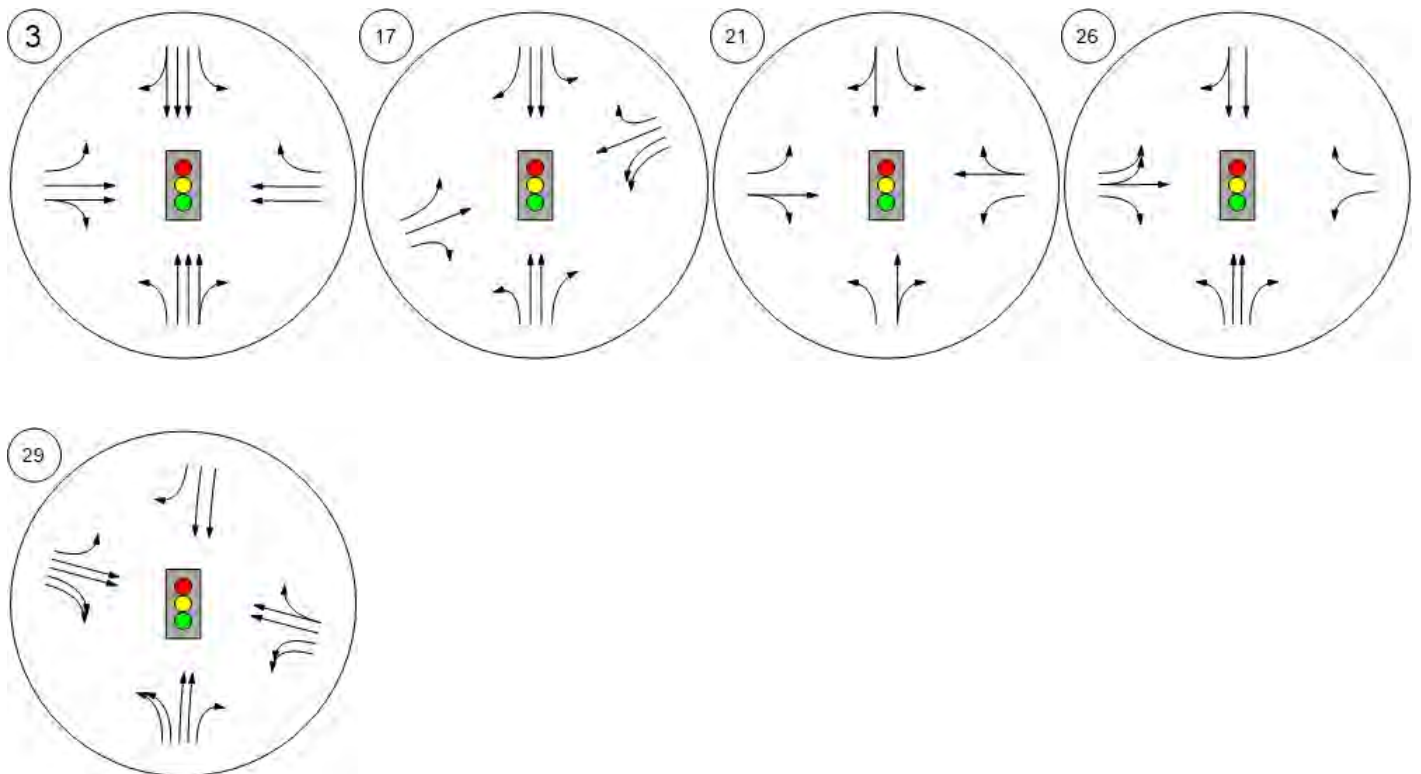
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Ring 2	-	-	6	5	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



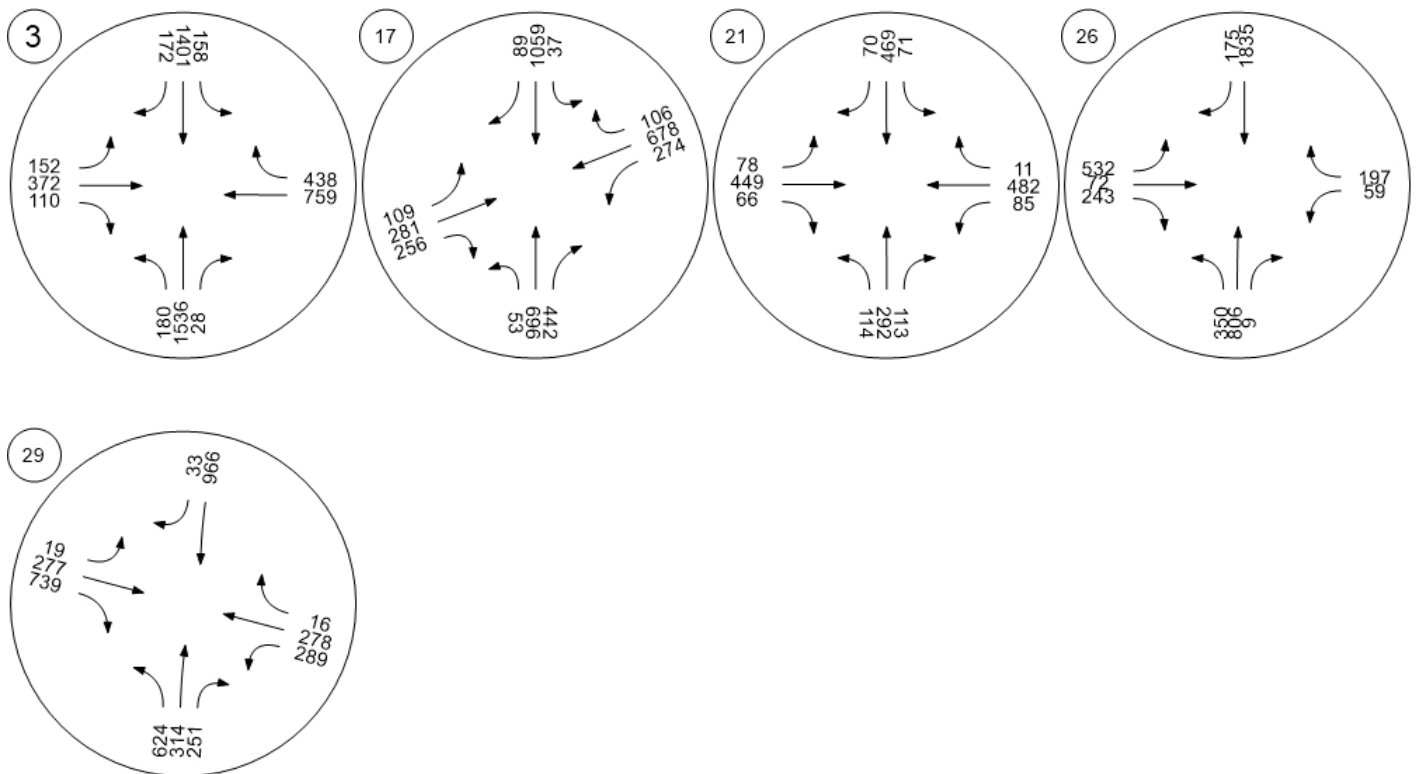
Study Intersections



Lane Configuration and Traffic Control



Traffic Volume - Base Volume



Traffic Conditions

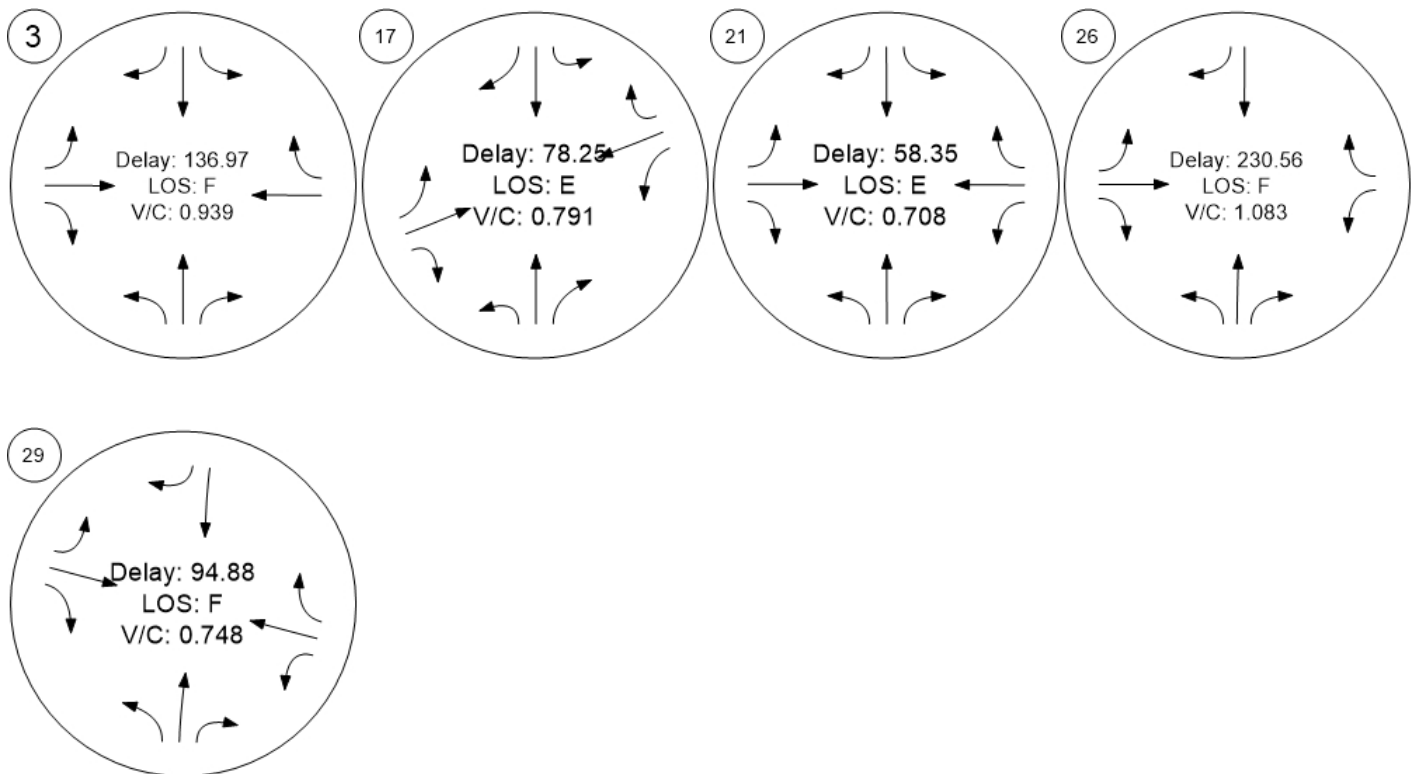


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Priority Growth Areas Mobility Study

Vistro File: Z:\...\Z0016285 PGA Sensitivity Analysis.vistro
Report File: Z:\...\PM Sensitivity Analysis +20% Volume.pdf

Scenario 9 +20% PM
2025-04-24

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
3	104 Avenue and 109 Street	Signalized	HCM 7th Edition	EB Left	0.996	160.9	F
17	Stony Plain Road and 149 Street	Signalized	HCM 7th Edition	WB Left	0.824	92.2	F
21	95 Avenue and 156 Street	Signalized	HCM 7th Edition	NB Left	0.761	69.8	E
26	109 Street and 87 Ave	Signalized	HCM 7th Edition	SB Thru	1.083	230.6	F
29	114 Street and 82 Ave	Signalized	HCM 7th Edition	SB Thru	0.784	111.3	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 3: 104 Avenue and 109 Street

Control Type:	Signalized	Delay (sec / veh):	160.9
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.996

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.66	3.60	3.60
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	0	0	1
Entry Pocket Length [m]	100.00	30.48	30.48	100.00	30.48	30.48	70.00	30.48	30.48	30.48	30.48	55.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	197	1675	28	173	1529	187	166	372	110	0	828	438
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	3	0	0	19	0	0	11	0	0	44
Total Hourly Volume [veh/h]	197	1675	28	173	1529	187	166	372	110	0	828	438
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	49	419	7	43	382	47	42	93	28	0	207	110
Total Analysis Volume [veh/h]	197	1675	28	173	1529	187	166	372	110	0	828	438
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	50			50			50			50		
v_di, Inbound Pedestrian Volume crossing m	50			50			50			50		
v_co, Outbound Pedestrian Volume crossing	50			50			50			50		
v_ci, Inbound Pedestrian Volume crossing mi	50			50			50			50		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	160
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	3	4	0	3	4	0	1	5	0	0	2	0
Auxiliary Signal Groups												
Maximum Green [s]	17	43	0	17	43	0	13	69	0	0	50	0
Amber [s]	4.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	3.0	3.0	0.0	3.0	3.0	0.0	2.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	25	0	0	25	0	0	25	0
Delayed Vehicle Green [s]	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	5.0	5.0	0.0	5.0	5.0	0.0	4.0	5.0	0.0	0.0	5.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering 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

Phasing & Timing: Pattern 1

Split [s]	24	62	0	24	62	0	20	74	0	0	54	0
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	0	10	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No	No		No	No		No	No			No	
Maximum Recall	Yes	Yes		Yes	Yes		Yes	Yes			Yes	
Pedestrian Recall	No	Yes		No	Yes		No	Yes			Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	C	R
C, Calculated Cycle Length [s]	160	160	160	160	160	160	160	160	160	160	160
L, Total Lost Time per Cycle [s]	7.00	7.00	7.00	7.00	7.00	7.00	6.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	5.00	5.00	5.00	5.00	5.00	5.00	4.00	5.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	17	50	50	17	50	50	14	62	62	42	42
g / C, Green / Cycle	0.11	0.31	0.31	0.11	0.31	0.31	0.09	0.39	0.39	0.26	0.26
(v / s)_i Volume / Saturation Flow Rate	0.13	0.38	0.38	0.12	0.39	0.40	0.11	0.15	0.16	0.28	0.35
s, saturation flow rate [veh/h]	1476	2951	1528	1476	2951	1411	1476	1683	1489	2951	1267
c, Capacity [veh/h]	157	922	478	157	922	441	129	652	577	775	333
d1, Uniform Delay [s]	71.50	55.00	55.00	71.50	55.00	55.00	73.00	35.24	35.56	59.00	56.69
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	156.58	106.24	117.52	102.10	117.83	148.91	174.47	1.70	2.09	52.30	162.36
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.26	1.21	1.22	1.10	1.24	1.30	1.29	0.38	0.40	1.07	1.32
d, Delay for Lane Group [s/veh]	228.08	161.24	172.52	173.60	172.83	203.91	247.47	36.94	37.65	111.30	219.05
Lane Group LOS	F	F	F	F	F	F	F	D	D	F	F
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	13.28	32.14	34.77	10.91	33.62	35.95	11.59	7.43	7.02	21.30	27.93
50th-Percentile Queue Length [m/ln]	101.19	244.90	264.97	83.10	256.20	273.96	88.29	56.60	53.51	162.33	212.85
95th-Percentile Queue Length [veh/ln]	20.97	46.58	50.18	16.98	49.06	53.17	18.69	11.90	11.37	30.06	42.30
95th-Percentile Queue Length [m/ln]	159.80	354.96	382.38	129.35	373.81	405.15	142.43	90.65	86.63	229.07	322.32

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	228.08	164.98	172.52	173.60	180.64	203.91	247.47	37.17	37.65	0.00	111.30	219.05
Movement LOS	F	F	F	F	F	F	F	D	D		F	F
d_A, Approach Delay [s/veh]	171.64			182.30			91.13			148.58		
Approach LOS	F			F			F			F		
d_I, Intersection Delay [s/veh]	160.90											
Intersection LOS	F											
Intersection V/C	0.996											

Emissions

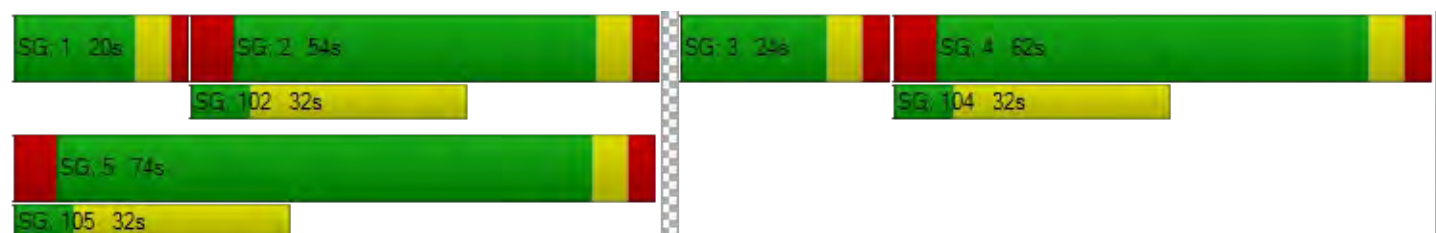
Vehicle Kilometers Traveled [km/h]	87.96	499.86	260.52	36.50	241.51	120.49	42.81	64.37	59.92	190.54	100.80
Stops [stops/h]	298.78	1446.24	782.39	245.37	1513.01	808.94	260.69	167.12	158.01	958.66	628.51
Fuel consumption [L/h]	49.68	219.03	119.87	32.11	209.30	119.31	41.56	16.98	15.98	110.61	97.58
CO [g/h]	917.31	4044.50	2213.38	592.86	3864.94	2203.08	767.40	313.47	295.17	2042.48	1801.90
NOx [g/h]	178.47	786.91	430.64	115.35	751.98	428.64	149.31	60.99	57.43	397.39	350.59
VOC [g/h]	212.59	937.35	512.97	137.40	895.74	510.58	177.85	72.65	68.41	473.36	417.61

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0			11.0			11.0			11.0		
M_corner, Corner Circulation Area [m²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	7.44			1.67			6.40			9.06		
d_p, Pedestrian Delay [s]	69.38			69.38			69.38			69.38		
I_p,int, Pedestrian LOS Score for Intersectio	3.138			3.259			2.724			2.771		
Crosswalk LOS	C			C			B			C		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	625			625			775			525		
d_b, Bicycle Delay [s]	37.81			37.81			30.01			43.51		
I_b,int, Bicycle LOS Score for Intersection	2.606			2.609			2.103			2.640		
Bicycle LOS	B			B			B			B		

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 17: Stony Plain Road and 149 Street

Control Type:	Signalized	Delay (sec / veh):	92.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.824

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
No. of Lanes in Entry Pocket	1	0	0	1	0	1	1	0	1	1	0	1
Entry Pocket Length [m]	90.00	30.48	30.48	65.00	30.48	75.00	50.00	30.48	0.00	110.00	30.48	75.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	60.00			60.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	53	696	482	41	1059	89	109	281	280	274	739	115
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	48	0	0	9	0	0	28	0	0	12
Total Hourly Volume [veh/h]	53	696	482	41	1059	89	109	281	280	274	739	115
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	13	174	121	10	265	22	27	70	70	69	185	29
Total Analysis Volume [veh/h]	53	696	482	41	1059	89	109	281	280	274	739	115
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	10			10			10			10		
v_di, Inbound Pedestrian Volume crossing m	10			10			10			10		
v_co, Outbound Pedestrian Volume crossing	10			10			10			10		
v_ci, Inbound Pedestrian Volume crossing mi	10			10			10			10		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	92.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	5	7	0	5	7	0	1	3	0	1	3	0
Auxiliary Signal Groups												
Maximum Green [s]	7	34	0	7	34	0	12	22	0	12	22	0
Amber [s]	4.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	30	0	0	30	0	0	19	0	0	19	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	5.0	0.0	2.0	5.0	0.0	5.0	5.0	0.0	5.0	5.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering 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

Phasing & Timing: Pattern 1

Split [s]	9	44	0	9	44	0	13	34	0	13	34	0
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Pedestrian Recall	No	Yes		No	Yes		No	Yes		No	Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Calculated Cycle Length [s]	100	100	100	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	7.00	7.00	4.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	5.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	46	37	37	46	37	37	6	27	27	6	27	27
g / C, Green / Cycle	0.46	0.37	0.37	0.46	0.37	0.37	0.06	0.27	0.27	0.06	0.27	0.27
(v / s)_i Volume / Saturation Flow Rate	0.08	0.21	0.30	0.06	0.32	0.06	0.07	0.15	0.18	0.09	0.40	0.07
s, saturation flow rate [veh/h]	665	3279	1589	653	3279	1547	1640	1870	1589	3186	1870	1589
c, Capacity [veh/h]	263	1213	588	324	1213	572	98	505	429	191	505	429
d1, Uniform Delay [s]	20.13	25.19	28.48	16.53	29.31	21.02	47.00	31.36	32.34	47.00	36.50	28.72
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering 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
d2, Incremental Delay [s]	1.71	1.98	12.10	0.80	8.82	0.58	122.67	4.38	7.51	222.42	219.36	1.53
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, 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

Lane Group Results

X, volume / capacity	0.20	0.57	0.82	0.13	0.87	0.16	1.11	0.56	0.65	1.43	1.46	0.27
d, Delay for Lane Group [s/veh]	21.84	27.17	40.58	17.33	38.13	21.60	169.67	35.74	39.85	269.42	255.86	30.25
Lane Group LOS	C	C	D	B	D	C	F	D	D	F	F	C
Critical Lane Group	Yes	No	No	No	Yes	No	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	0.77	6.64	11.86	0.57	12.66	1.44	5.78	6.35	6.79	8.26	42.76	2.33
50th-Percentile Queue Length [m/ln]	5.87	50.63	90.37	4.33	96.46	10.96	44.05	48.39	51.75	62.95	325.84	17.77
95th-Percentile Queue Length [veh/ln]	1.39	10.87	17.51	1.02	18.49	2.59	10.02	10.48	11.06	14.25	64.82	4.20
95th-Percentile Queue Length [m/ln]	10.57	82.84	133.40	7.79	140.92	19.73	76.37	79.88	84.31	108.61	493.93	31.99

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	21.84	27.17	40.58	17.33	38.13	21.60	169.67	35.74	39.85	269.42	255.86	30.25
Movement LOS	C	C	D	B	D	C	F	D	D	F	F	C
d_A, Approach Delay [s/veh]	32.19			36.17			59.25			236.15		
Approach LOS	C			D			E			F		
d_I, Intersection Delay [s/veh]	92.16											
Intersection LOS	F											
Intersection V/C	0.824											

Emissions

Vehicle Kilometers Traveled [km/h]	13.31	174.81	121.06	8.56	221.18	18.59	25.95	66.89	66.65	98.73	266.29	41.44
Stops [stops/h]	27.75	478.35	426.93	20.44	911.40	51.80	208.10	228.60	244.47	594.78	1539.40	83.97
Fuel consumption [L/h]	2.95	45.22	39.39	1.95	79.78	4.77	21.38	19.23	20.42	79.59	205.49	8.51
CO [g/h]	54.40	835.05	727.32	36.05	1473.21	88.10	394.82	355.04	377.09	1469.69	3794.51	157.07
NOx [g/h]	10.58	162.47	141.51	7.01	286.63	17.14	76.82	69.08	73.37	285.95	738.27	30.56
VOC [g/h]	12.61	193.53	168.56	8.36	341.43	20.42	91.50	82.28	87.39	340.62	879.42	36.40

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0			11.0			11.0			11.0		
M_corner, Corner Circulation Area [m²/ped]	0.00			93.10			0.00			0.00		
M_CW, Crosswalk Circulation Area [m²/ped]	45.41			61.26			66.36			33.25		
d_p, Pedestrian Delay [s]	39.61			39.61			39.61			39.61		
I_p,int, Pedestrian LOS Score for Intersectio	2.982			2.901			2.533			2.672		
Crosswalk LOS	C			C			B			B		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	740			740			540			540		
d_b, Bicycle Delay [s]	19.85			19.85			26.65			26.65		
I_b,int, Bicycle LOS Score for Intersection	2.615			2.548			2.711			3.441		
Bicycle LOS	B			B			B			C		

Sequence

Ring 1	1	3	5	7	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 21: 95 Avenue and 156 Street

Control Type:	Signalized	Delay (sec / veh):	69.8
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.761

Intersection Setup

Name												
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	0
Entry Pocket Length [m]	75.00	30.48	30.48	75.00	30.48	30.48	30.48	30.48	30.48	30.48	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	125	318	113	71	511	70	78	490	66	85	526	11
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	11	0	0	7	0	0	7	0	0	1
Total Hourly Volume [veh/h]	125	318	113	71	511	70	78	490	66	85	526	11
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	31	80	28	18	128	18	20	123	17	21	132	3
Total Analysis Volume [veh/h]	125	318	113	71	511	70	78	490	66	85	526	11
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	20			20			20			20		
v_di, Inbound Pedestrian Volume crossing m	20			20			20			20		
v_co, Outbound Pedestrian Volume crossing	20			20			20			20		
v_ci, Inbound Pedestrian Volume crossing mi	20			20			20			20		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fixed time
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	1	3	0	1	3	0	5	7	0	5	7	0
Auxiliary Signal Groups												
Maximum Green [s]	14	28	0	14	28	0	10	40	0	10	40	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	29	0	0	29	0	0	30	0	0	30	0
Delayed Vehicle Green [s]	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	3.0	0.0	3.0	3.0	0.0	1.0	3.0	0.0	1.0	3.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering 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

Phasing & Timing: Pattern 1

Split [s]	14	48	0	14	48	0	8	50	0	8	50	0
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Pedestrian Recall	No	Yes		No	Yes		No	Yes		No	Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	3.00	3.00	0.00	3.00	0.00	3.00
g_i, Effective Green Time [s]	9	38	9	38	53	40	53	40
g / C, Green / Cycle	0.08	0.32	0.08	0.32	0.44	0.33	0.44	0.33
(v / s)_i Volume / Saturation Flow Rate	0.08	0.24	0.04	0.32	0.08	0.33	0.08	0.31
s, saturation flow rate [veh/h]	1640	1767	1640	1821	1028	1672	1016	1714
c, Capacity [veh/h]	123	559	123	577	277	557	253	571
d1, Uniform Delay [s]	55.50	37.06	53.66	41.00	25.74	39.95	26.88	38.84
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	85.48	9.85	18.22	39.34	2.52	37.48	3.56	25.45
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.02	0.77	0.58	1.01	0.28	1.00	0.34	0.94
d, Delay for Lane Group [s/veh]	140.98	46.91	71.88	80.34	28.26	77.43	30.44	64.29
Lane Group LOS	F	D	E	F	C	E	C	E
Critical Lane Group	Yes	No	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	6.63	12.84	2.69	23.05	1.48	21.87	1.66	19.13
50th-Percentile Queue Length [m/ln]	50.54	97.87	20.52	175.64	11.26	166.65	12.61	145.73
95th-Percentile Queue Length [veh/ln]	10.92	18.72	4.85	31.08	2.66	29.54	2.98	26.30
95th-Percentile Queue Length [m/ln]	83.18	142.66	36.94	236.84	20.27	225.09	22.71	200.39

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	140.98	46.91	46.91	71.88	80.34	80.34	28.26	77.43	77.43	30.44	64.29	64.29
Movement LOS	F	D	D	E	F	F	C	E	E	C	E	E
d_A, Approach Delay [s/veh]	68.06			79.42			71.38			59.67		
Approach LOS	E			E			E			E		
d_I, Intersection Delay [s/veh]	69.80											
Intersection LOS	E											
Intersection V/C	0.761											

Emissions

Vehicle Kilometers Traveled [km/h]	31.59	108.92	24.07	196.99	22.31	159.06	29.23	184.65
Stops [stops/h]	198.96	385.33	80.80	691.50	44.34	656.11	49.66	573.75
Fuel consumption [L/h]	21.04	34.58	8.03	70.21	4.82	63.01	5.89	57.03
CO [g/h]	388.55	638.55	148.35	1296.42	88.93	1163.50	108.72	1053.13
NOx [g/h]	75.60	124.24	28.86	252.24	17.30	226.38	21.15	204.90
VOC [g/h]	90.05	147.99	34.38	300.46	20.61	269.65	25.20	244.07

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [m²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	25.49	28.68	23.46	20.20
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
I_p,int, Pedestrian LOS Score for Intersectio	2.428	2.362	2.500	2.476
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	633	633	667	667
d_b, Bicycle Delay [s]	28.02	28.02	26.67	26.67
I_b,int, Bicycle LOS Score for Intersection	2.495	2.647	2.617	2.588
Bicycle LOS	B	B	B	B

Sequence

Ring 1	1	3	5	7	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 26: 109 Street and 87 Ave

Control Type:	Signalized	Delay (sec / veh):	230.6
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.083

Intersection Setup												
Name	109 Street				109 Street				87 Ave			
Approach	Northbound				Southbound				Eastbound			
Lane Configuration												
Turning Movement	Left	Thru	Thru	Right	Left	Left	Thru	Right	Left	Left	Thru	Right
Lane Width [m]	3.20	3.66	3.20	4.00	3.66	3.66	3.60	4.50	3.50	3.50	3.50	3.50
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	1
Entry Pocket Length [m]	80.00	30.48	30.48	35.00	30.48	30.48	30.48	30.48	30.48	30.48	30.48	45.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00				50.00				50.00			
Grade [%]	0.00				0.00				0.00			
Curb Present	Yes				Yes				Yes			
Crosswalk	Yes				Yes				Yes			

Volumes

Name	109 Street				109 Street				87 Ave			
Base Volume Input [veh/h]	350	806	0	9	0	0	1835	175	532	0	72	243
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	1	0	0	0	18	0	0	0	24
Total Hourly Volume [veh/h]	350	806	0	8	0	0	1835	157	532	0	72	219
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	88	202	0	2	0	0	459	39	133	0	18	55
Total Analysis Volume [veh/h]	350	806	0	8	0	0	1835	157	532	0	72	219
Presence of On-Street Parking	No			No	No			No	No			No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	106				0				51			
v_di, Inbound Pedestrian Volume crossing th	105				0				51			
v_co, Outbound Pedestrian Volume along th	41				51				105			
v_ci, Inbound Pedestrian Volume along the l	40				51				106			
v_ab, Corner Pedestrian Volume [ped/h]	0				0				0			
Bicycle Volume [bicycles/h]	19				25				9			

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	110
Active Pattern	Pattern 2
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	3.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Overlap	Overlap	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	1	0	3	0	0	1	0	0	0	3	2
Auxiliary Signal Groups	1,2	1,2		1,3								
Maximum Green [s]	30	59	0	26	0	0	59	0	0	0	26	30
Amber [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
All red [s]	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	2.0
Walk [s]	0	8	0	7	0	0	8	0	0	0	7	0
Pedestrian Clearance [s]	0	16	0	19	0	0	16	0	0	0	19	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk												
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering 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

Phasing & Timing: Pattern 2

Split [s]	12	43	0	25	0	0	43	0	0	0	25	12
Lead / Lag	Lag	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	24	0	20	0	0	24	0	0	0	20	5
Vehicle Extension [s]	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	3.0
Minimum Recall	No	Yes		No			Yes				No	
Maximum Recall	Yes	No		No			No				No	
Pedestrian Recall	No	No		Yes			No				Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	4
Pedestrian Walk [s]	7
Pedestrian Clearance [s]	23

Lane Group Calculations

Lane Group	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	110	110	110	110	110	110	110	110
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	3.00	3.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	50	50	75	38	38	20	20	20
g / C, Green / Cycle	0.46	0.46	0.68	0.35	0.35	0.18	0.18	0.18
(v / s)_i Volume / Saturation Flow Rate	0.78	0.25	0.01	0.59	0.59	0.25	0.31	0.16
s, saturation flow rate [veh/h]	448	3204	1456	1683	1688	1086	1053	1398
c, Capacity [veh/h]	240	1458	992	582	584	243	250	254
d1, Uniform Delay [s]	45.39	21.83	5.58	35.98	35.98	48.42	48.10	43.47
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.47	0.50	0.18
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	227.03	1.51	0.01	327.20	324.92	94.27	169.46	13.25
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.46	0.55	0.01	1.71	1.71	1.13	1.32	0.86
d, Delay for Lane Group [s/veh]	272.41	23.34	5.60	363.18	360.90	142.70	217.56	56.73
Lane Group LOS	F	C	A	F	F	F	F	E
Critical Lane Group	Yes	No	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	19.03	7.69	0.06	68.09	67.92	13.09	18.66	6.64
50th-Percentile Queue Length [m/ln]	145.03	58.62	0.45	518.81	517.54	99.74	142.19	50.61
95th-Percentile Queue Length [veh/ln]	32.12	12.24	0.11	106.21	105.88	20.15	29.14	10.87
95th-Percentile Queue Length [m/ln]	244.79	93.28	0.80	809.29	806.83	153.56	222.07	82.82

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	272.41	23.34	0.00	5.60	0.00	0.00	362.13	360.90	178.50	0.00	217.56	56.73
Movement LOS	F	C		A			F	F	F		F	E
d_A, Approach Delay [s/veh]	98.11				362.04				149.83			
Approach LOS	F				F				F			
d_I, Intersection Delay [s/veh]	230.56											
Intersection LOS	F											
Intersection V/C	1.083											

Emissions

Vehicle Kilometers Traveled [km/h]	36.98	85.15	0.85	103.13	103.13	54.10	65.10	43.22
Stops [stops/h]	622.89	503.55	1.92	2228.24	2222.79	428.36	610.70	217.37
Fuel consumption [L/h]	90.92	33.89	0.16	338.38	336.51	44.88	75.17	18.56
CO [g/h]	1678.92	625.80	2.92	6248.36	6213.87	828.81	1387.99	342.68
NOx [g/h]	326.66	121.76	0.57	1215.70	1208.99	161.26	270.05	66.67
VOC [g/h]	389.11	145.03	0.68	1448.12	1440.12	192.09	321.68	79.42

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0				11.0				11.0			
M_corner, Corner Circulation Area [m ² /ped]	8.37				54.68				0.00			
M_CW, Crosswalk Circulation Area [m ² /ped]	3.92				0.00				5.82			
d_p, Pedestrian Delay [s]	44.55				44.55				44.55			
I_p,int, Pedestrian LOS Score for Intersectio	3.103				2.765				2.614			
Crosswalk LOS	C				C				B			
s_b, Saturation Flow Rate of the bicycle lane	2000				2000				2000			
c_b, Capacity of the bicycle lane [bicycles/h]	909				691				364			
d_b, Bicycle Delay [s]	16.52				23.86				36.98			
I_b,int, Bicycle LOS Score for Intersection	2.521				3.218				2.957			
Bicycle LOS	B				C				C			

Intersection Setup								
Name	87 Ave							
Approach	Westbound				Southwestbound			
Lane Configuration								
Turning Movement	Left	Thru	Right	Right	Left	Thru	Right	Right
Lane Width [m]	3.50	3.66	3.50	3.66	3.66	3.66	3.66	3.66
No. of Lanes in Entry Pocket	0	0	0	1	0	0	0	0
Entry Pocket Length [m]	30.48	30.48	30.48	10.00	30.48	30.48	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	30.00				50.00			
Grade [%]	0.00				0.00			
Curb Present	Yes							
Crosswalk	Yes				Yes			

Volumes

Name	87 Ave							
Base Volume Input [veh/h]	59	0	0	197	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00							
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	20	0	0	0	0
Total Hourly Volume [veh/h]	59	0	0	177	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	15	0	0	44	0	0	0	0
Total Analysis Volume [veh/h]	59	0	0	177	0	0	0	0
Presence of On-Street Parking	No			No				
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	40				0			
v_di, Inbound Pedestrian Volume crossing th	41				0			
v_co, Outbound Pedestrian Volume along th	0				0			
v_ci, Inbound Pedestrian Volume along the l	0				0			
v_ab, Corner Pedestrian Volume [ped/h]	0				0			
Bicycle Volume [bicycles/h]	0				0			

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	110
Active Pattern	Pattern 2
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	3.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	3	0	0	0	0	0	0	0
Auxiliary Signal Groups								
Maximum Green [s]	26	0	0	0	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All red [s]	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Walk [s]	7	0	0	0	0	0	0	0
Pedestrian Clearance [s]	19	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk								
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 2

Split [s]	25	0	0	0	0	0	0	0
Lead / Lag	Lag	-	-	-	-	-	-	-
Minimum Green [s]	20	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	No							
Maximum Recall	No							
Pedestrian Recall	Yes							

Exclusive Pedestrian Phase

Pedestrian Signal Group	4
Pedestrian Walk [s]	7
Pedestrian Clearance [s]	23

Lane Group Calculations

Lane Group	L	R	
C, Calculated Cycle Length [s]	110	110	
L, Total Lost Time per Cycle [s]	5.00	5.00	
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	
l2, Clearance Lost Time [s]	3.00	3.00	
g_i, Effective Green Time [s]	20	20	
g / C, Green / Cycle	0.18	0.18	
(v / s)_i Volume / Saturation Flow Rate	0.06	0.12	
s, saturation flow rate [veh/h]	979	1431	
c, Capacity [veh/h]	65	260	
d1, Uniform Delay [s]	55.00	42.02	
k, delay calibration	0.11	0.11	
l, Upstream Filtering Factor	1.00	1.00	
d2, Incremental Delay [s]	31.69	3.12	
d3, Initial Queue Delay [s]	0.00	0.00	
Rp, platoon ratio	1.00	1.00	
PF, progression factor	1.00	1.00	

Lane Group Results

X, volume / capacity	0.90	0.68	
d, Delay for Lane Group [s/veh]	86.69	45.13	
Lane Group LOS	F	D	
Critical Lane Group	No	No	
50th-Percentile Queue Length [veh/ln]	2.24	4.80	
50th-Percentile Queue Length [m/ln]	17.06	36.55	
95th-Percentile Queue Length [veh/ln]	4.03	8.39	
95th-Percentile Queue Length [m/ln]	30.71	63.91	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	86.69	0.00	0.00	45.13	0.00	0.00	0.00	0.00
Movement LOS	F			D				
d_A, Approach Delay [s/veh]	55.52				0.00			
Approach LOS	E				A			
d_I, Intersection Delay [s/veh]	230.56							
Intersection LOS	F							
Intersection V/C	1.083							

Emissions

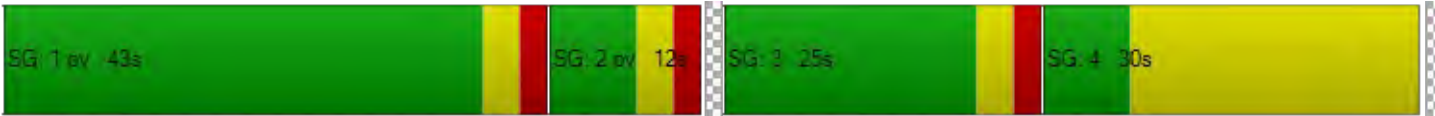
Vehicle Kilometers Traveled [km/h]	2.14	6.43	
Stops [stops/h]	73.27	156.96	
Fuel consumption [L/h]	4.79	8.19	
CO [g/h]	88.40	151.23	
NOx [g/h]	17.20	29.42	
VOC [g/h]	20.49	35.05	

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0
M_corner, Corner Circulation Area [m²/ped]	0.00	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	14.11	0.00
d_p, Pedestrian Delay [s]	44.55	44.55
I_p,int, Pedestrian LOS Score for Intersectio	2.046	3.296
Crosswalk LOS	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	364	0
d_b, Bicycle Delay [s]	36.82	55.00
I_b,int, Bicycle LOS Score for Intersection	1.560	4.132
Bicycle LOS	A	D

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 29: 114 Street and 82 Ave

Control Type:	Signalized	Delay (sec / veh):	111.3
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.784

Intersection Setup

Name	114 Street			114 Street			University Ave			82 Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	↵↵↵			↵↵			↵↵↵↵			↵↵↵		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [m]	3.50	3.70	3.60	3.66	3.60	3.60	4.00	3.60	3.60	3.66	3.66	3.66
No. of Lanes in Entry Pocket	2	0	1	0	0	1	1	0	1	2	0	0
Entry Pocket Length [m]	170.00	30.48	2.00	30.48	30.48	105.00	95.00	30.48	95.00	100.00	30.48	30.48
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [m]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [km/h]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	114 Street			114 Street			University Ave			82 Ave		
Base Volume Input [veh/h]	624	314	274	0	1054	33	20	302	806	289	304	16
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	27	0	0	3	0	0	0	0	0	2
Total Hourly Volume [veh/h]	624	314	247	0	1054	33	20	302	806	289	304	16
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	156	79	62	0	264	8	5	76	202	72	76	4
Total Analysis Volume [veh/h]	624	314	247	0	1054	33	20	302	806	289	304	16
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	4			2			3			2		
v_di, Inbound Pedestrian Volume crossing m	3			2			4			2		
v_co, Outbound Pedestrian Volume crossing	13			0			0			13		
v_ci, Inbound Pedestrian Volume crossing mi	13			0			0			13		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	142
Active Pattern	Pattern 2
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing (Basic)

Control Type	Protecte	Overlap	Permiss	Permiss	Permiss	Overlap	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss
Signal Group	2	1	0	0	1	2	3	6	2	5	4	0
Auxiliary Signal Groups		1,2				1,2			2,6			
Maximum Green [s]	38	33	0	0	33	38	10	38	38	16	38	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0
All red [s]	3.0	3.0	0.0	0.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0	0.0
Walk [s]	0	9	0	0	9	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	24	0	0	24	0	0	22	0	0	22	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.0	4.0	0.0	0.0	4.0	4.0	5.0	5.0	4.0	5.0	5.0	0.0
Detector Location [m]	1.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	0.0
Detector Length [m]	5.0	5.0	0.0	0.0	5.0	5.0	5.0	0.0	0.0	5.0	5.0	0.0
Advanced Detector Location [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering 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

Phasing & Timing: Pattern 2

Split [s]	44	39	0	0	39	44	17	36	44	23	42	0
Lead / Lag	Lag	-	-	-	-	-	Lead	-	-	Lag	-	-
Minimum Green [s]	10	27	0	0	27	10	7	29	10	7	29	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0
Minimum Recall	No	Yes			Yes	No	No	No	No	No	No	
Maximum Recall	No	No			No	No	No	Yes	No	No	Yes	
Pedestrian Recall	No	No			No	No	No	No	No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	C	R	L	C	R	L	C	C
C, Calculated Cycle Length [s]	151	151	151	151	151	151	151	151	151	151	151
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	7.00	7.00	7.00	7.00	7.00	7.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	0.00	4.00	4.00	0.00	5.00	5.00	0.00	5.00	5.00	5.00
g_i, Effective Green Time [s]	38	77	33	33	77	4	38	82	16	50	50
g / C, Green / Cycle	0.25	0.51	0.22	0.22	0.51	0.03	0.25	0.54	0.10	0.33	0.33
(v / s)_i Volume / Saturation Flow Rate	0.26	0.10	0.17	0.33	0.03	0.01	0.10	0.35	0.09	0.10	0.10
s, saturation flow rate [veh/h]	2404	3204	1431	3204	1318	1535	2951	2325	3113	1550	1522
c, Capacity [veh/h]	622	1636	313	701	673	41	744	1264	327	511	502
d1, Uniform Delay [s]	58.80	20.03	55.63	58.91	18.53	72.35	47.01	24.00	66.60	37.79	37.80
k, delay calibration	0.11	0.11	0.27	0.24	0.11	0.11	0.50	0.20	0.11	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	17.70	0.06	10.39	230.15	0.03	8.49	1.65	1.02	7.93	1.61	1.65
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.00	0.19	0.79	1.50	0.05	0.48	0.41	0.64	0.88	0.32	0.32
d, Delay for Lane Group [s/veh]	76.50	20.09	66.02	289.07	18.56	80.84	48.66	25.01	74.53	39.40	39.45
Lane Group LOS	F	C	E	F	B	F	D	C	E	D	D
Critical Lane Group	Yes	No	No	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	13.64	3.07	9.80	35.78	0.60	0.86	4.95	10.15	5.87	4.75	4.68
50th-Percentile Queue Length [m/ln]	103.93	23.41	74.67	272.66	4.58	6.59	37.71	77.32	44.70	36.20	35.70
95th-Percentile Queue Length [veh/ln]	19.74	5.53	14.93	54.88	1.08	1.56	8.60	15.37	9.84	8.32	8.23
95th-Percentile Queue Length [m/ln]	150.42	42.14	113.80	418.22	8.24	11.86	65.51	117.13	74.97	63.43	62.74

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	76.50	20.09	66.02	0.00	289.07	18.56	80.84	48.66	25.01	74.53	39.42	39.45
Movement LOS	F	C	E		F	B	F	D	C	E	D	D
d_A, Approach Delay [s/veh]	59.37			280.86			32.33			56.08		
Approach LOS	E			F			C			E		
d_I, Intersection Delay [s/veh]	111.32											
Intersection LOS	F											
Intersection V/C	0.784											

Emissions

Vehicle Kilometers Traveled [km/h]	176.63	88.88	69.92	243.63	7.63	6.58	99.30	265.01	47.95	26.75	26.34
Stops [stops/h]	651.04	146.65	233.90	1708.10	14.33	20.64	236.23	484.38	280.01	113.37	111.81
Fuel consumption [L/h]	68.18	16.61	24.46	296.14	1.52	2.33	26.06	51.61	27.43	9.98	9.84
CO [g/h]	1258.90	306.62	451.65	5468.47	28.05	43.10	481.30	953.02	506.56	184.30	181.69
NOx [g/h]	244.94	59.66	87.88	1063.97	5.46	8.39	93.64	185.42	98.56	35.86	35.35
VOC [g/h]	291.76	71.06	104.67	1267.37	6.50	9.99	111.55	220.87	117.40	42.71	42.11

Other Modes

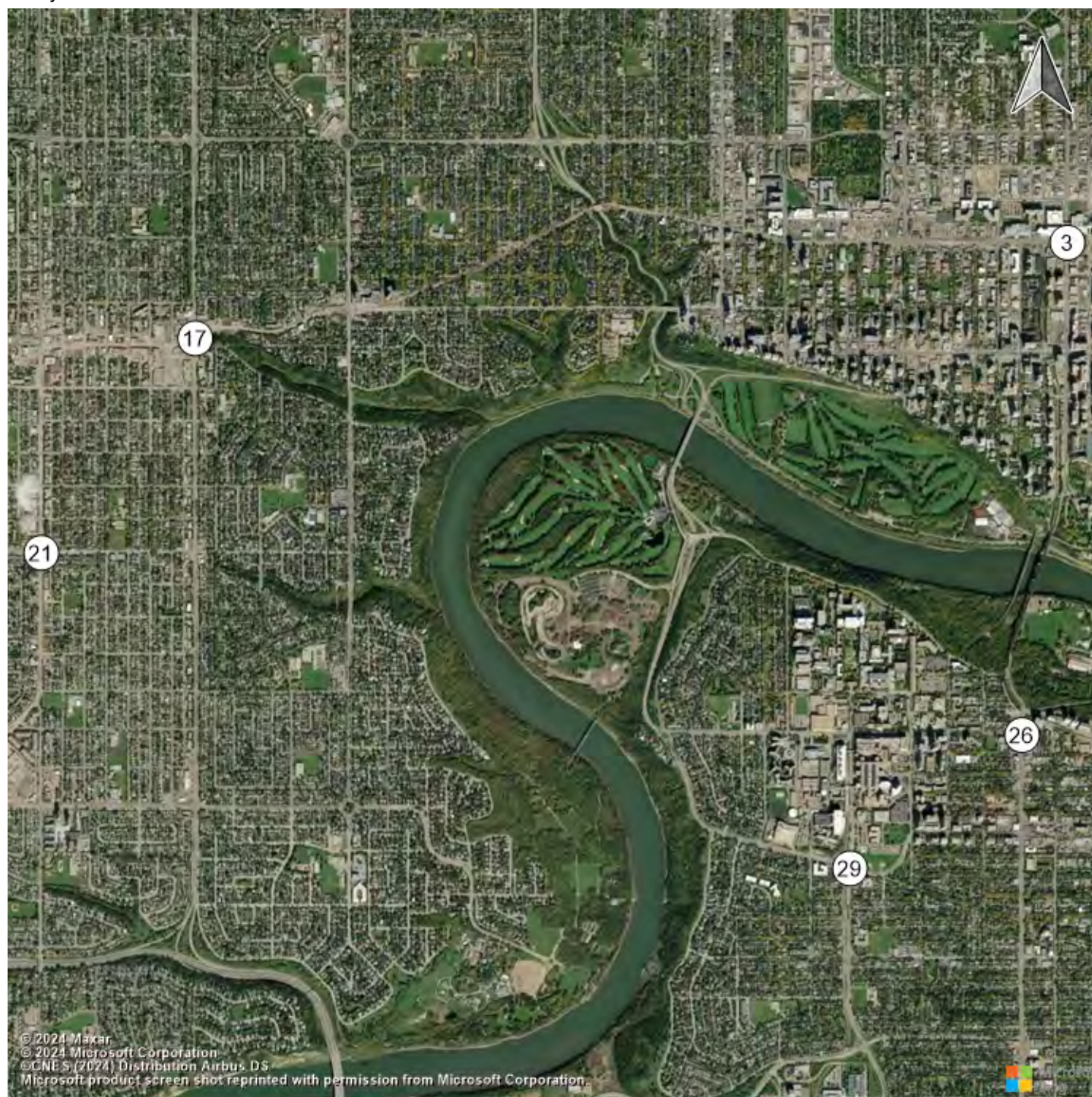
g_Walk,mi, Effective Walk Time [s]	11.0	11.0	13.0	13.0
M_corner, Corner Circulation Area [m²/ped]	25.12	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [m²/ped]	0.00	245.97	0.00	26.04
d_p, Pedestrian Delay [s]	64.82	64.82	62.98	62.98
I_p,int, Pedestrian LOS Score for Intersectio	3.012	2.620	3.807	2.679
Crosswalk LOS	C	B	D	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1021	438	385	464
d_b, Bicycle Delay [s]	18.07	46.03	49.20	44.48
I_b,int, Bicycle LOS Score for Intersection	2.560	2.459	2.490	2.064
Bicycle LOS	B	B	B	B

Sequence

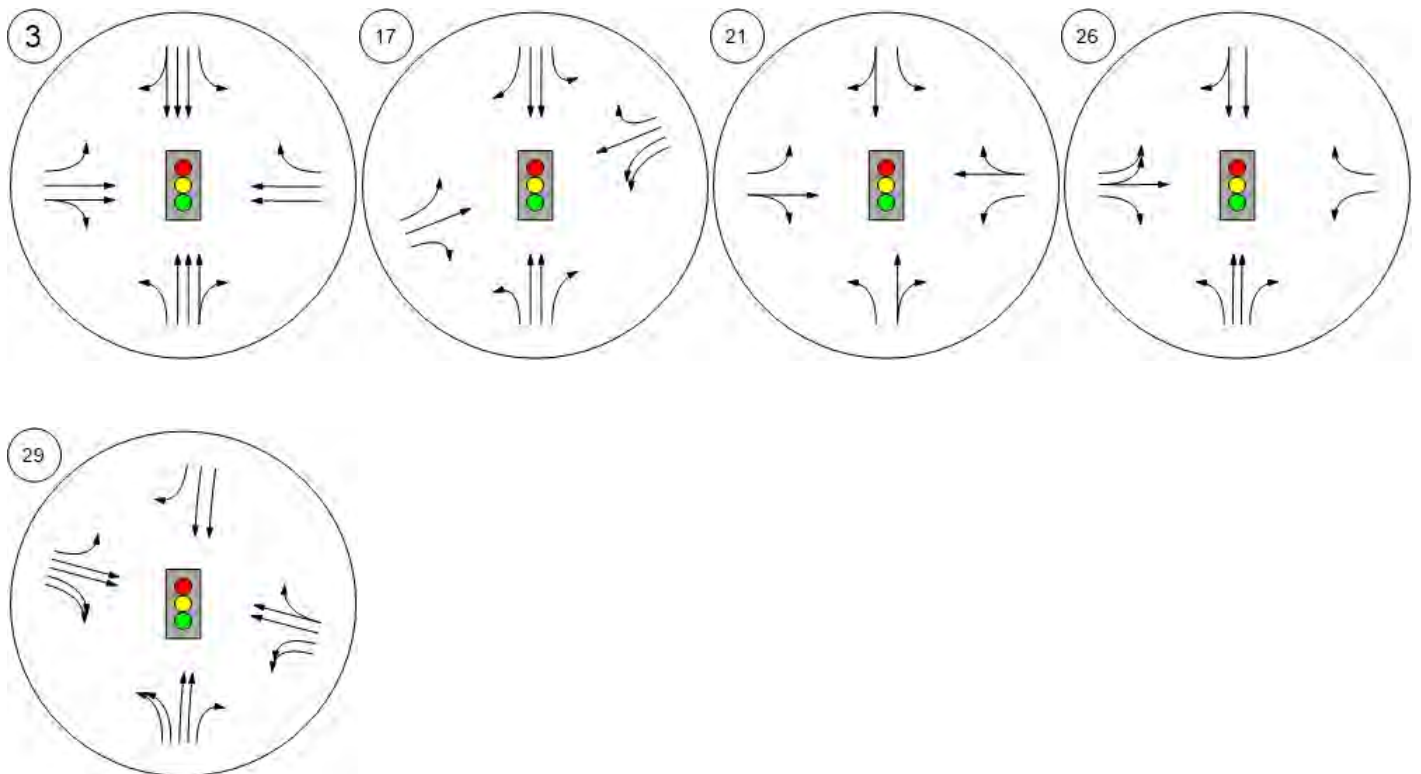
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Ring 2	-	-	6	5	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



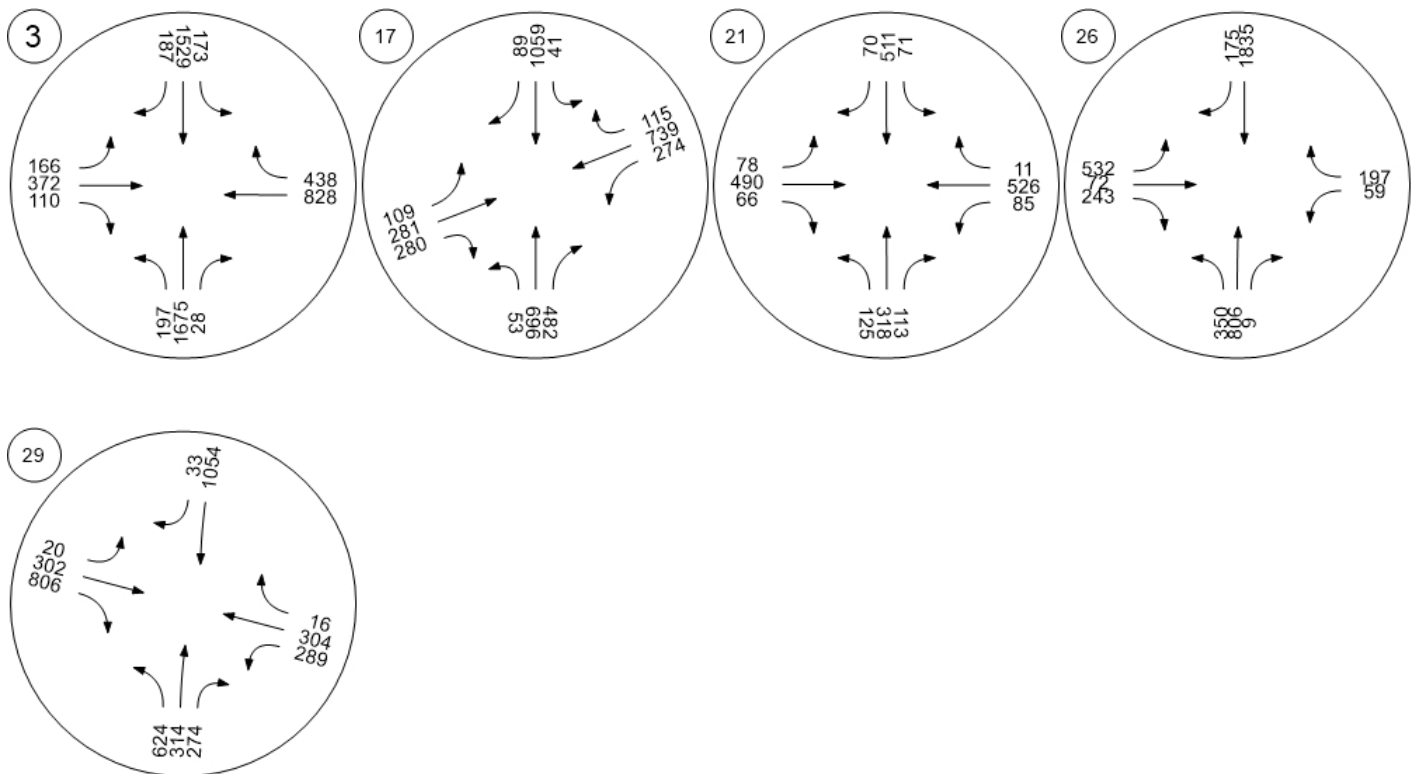
Study Intersections



Lane Configuration and Traffic Control



Traffic Volume - Base Volume



Traffic Conditions

