Volume			11								
Peak Hour Factor, PHF			0.91								
Hourly Flow Rate, HFR			12								
Percent Heavy Vehicles			0								
Percent Grade (%)				0					0		
Flared Approach: Exists?/Storage						/				/	
Lanes				1							
Configuration				L							

Delay, Queue Length, and Level of Service											
Approach	EB	WB		Northbound				Southbound			
Movement	1	4	|	7	8	9	|	10	11	12	
Lane Config		LT	|	L			|				
v (vph)		20		12							
C(m) (vph)		1597		224							
v/c		0.01		0.05							
95% queue length		0.04		0.17							
Control Delay		7.3		22.0							
LOS		A		C							
Approach Delay						22.0					
Approach LOS						C					

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023
Analysis Time Period:	Pico Tarde
Intersection:	J
Jurisdiction:	DER/DF
Units: U. S. Metric	
Analysis Year:	2023
Project ID: FUTURA	
East/West Street:	M2-M10
North/South Street:	M9
Intersection Orientation: EW	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				19	1987	
Peak-Hour Factor, PHF				0.91	0.91	
Peak-15 Minute Volume				5	546	
Hourly Flow Rate, HFR				20	2183	
Percent Heavy Vehicles	--	--		6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration					LT T	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	11					
Peak Hour Factor, PHF	0.91					
Peak-15 Minute Volume	3					
Hourly Flow Rate, HFR	12					
Percent Heavy Vehicles	0					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						

Lanes	1
Configuration	L

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		6	0					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.2	6.4					
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		6	0					
t(f)		2.3	3.5					

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		0	1131					
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		3000						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.		9		12
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Movement Capacity				
Probability of Queue free St.		1.00		1.00
Step 2: LT from Major St.		4		1
Conflicting Flows	0			
Potential Capacity	1597			
Pedestrian Impedance Factor	1.00		1.00	

Movement Capacity	1597	
Probability of Queue free St.	0.99	1.00
Maj L-Shared Prob Q free St.	0.99	

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	1131	
Potential Capacity	227	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	224	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	1131	
Potential Capacity	227	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99

Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	224	

Results for Two-stage process:	
a	
y	
C t	224

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	12					
Movement Capacity (vph)	224					
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	224					
Volume	12					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		20	12					
C(m) (vph)		1597	224					
v/c		0.01	0.05					
95% queue length		0.04	0.17					
Control Delay		7.3	22.0					
LOS		A	C					
Approach Delay				22.0				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

1.1.4 Memória de cálculo da análise de capacidade e níveis de serviço – Cenário FUTURO Com empreendimento em funcionamento e com acréscimo de área – USO COMERCIAL

1.1.4.1 Interseção A – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023
Analysis Time Period:	Pico Manha
Intersection:	A
Jurisdiction:	DER/DF
Units: U. S. Metric	
Analysis Year:	2023
Project ID:	FUTURA COMERCIAL
East/West Street:	MOV01-MOV04
North/South Street:	MOV04
Intersection Orientation: EW	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		1819	48			
Peak-Hour Factor, PHF		0.91	1.00			
Hourly Flow Rate, HFR		1998	48			
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		2	0			
Configuration		T	TR			
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume			15			
Peak Hour Factor, PHF			0.91			
Hourly Flow Rate, HFR			16			
Percent Heavy Vehicles			0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes			1			
Configuration			R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config					R			
v (vph)					16			
C(m) (vph)					289			
v/c					0.06			
95% queue length					0.18			
Control Delay					18.2			
LOS					C			
Approach Delay					18.2			
Approach LOS					C			

HCS+: Unsignalized Intersections Release 5.6

E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: A
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: MOV01-MOV04
North/South Street: MOV04
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		1819	48			
Peak-Hour Factor, PHF		0.91	1.00			
Peak-15 Minute Volume		500	12			
Hourly Flow Rate, HFR		1998	48			
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		2	0			
Configuration		T	TR			
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume			15			
Peak Hour Factor, PHF			0.91			
Peak-15 Minute Volume			4			
Hourly Flow Rate, HFR			16			
Percent Heavy Vehicles			0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized			No			
Lanes			1			
Configuration			R			

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)					6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)					0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)					0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage					6.2			
2-stage								

Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)					3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)					0			
t(f)					3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			

p(12)

Computation 4 and 5								
Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x					1023			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process								
	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	1023	
Potential Capacity	289	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	289	
Probability of Queue free St.	0.94	1.00
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.94
Movement Capacity		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						

Part 3 - Single Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor				1.00		1.00
Cap. Adj. factor due to Impeding mvmnt				1.00		1.00
Movement Capacity						

Result for 2 stage process:						
a						
y						
C t						
Probability of Queue free St.				1.00		1.00

Step 4: LT from Minor St.				7		10

Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						

Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						

Part 3 - Single Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor				1.00		1.00
Maj. L, Min T Impedance factor						1.00
Maj. L, Min T Adj. Imp Factor.						1.00
Cap. Adj. factor due to Impeding mvmnt				1.00		0.94
Movement Capacity						

Results for Two-stage process:						
a						
y						
C t						

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)			16			
Movement Capacity (vph)			289			
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep			289			
Volume			16			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max						
C sh						
SUM C sep						
n						

C act

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config					R			
v (vph)					16			
C(m) (vph)					289			
v/c					0.06			
95% queue length					0.18			
Control Delay					18.2			
LOS					C			
Approach Delay				18.2				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

1.1.4.2 Interseção A – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: A
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID:
East/West Street: MOV01-MOV04
North/South Street: MOV04
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		731	154			
Peak-Hour Factor, PHF		0.91	0.91			
Hourly Flow Rate, HFR		803	169			
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		2	0			
Configuration		T	TR			
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume			164			
Peak Hour Factor, PHF			0.91			
Hourly Flow Rate, HFR			180			
Percent Heavy Vehicles			0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/

Lanes	1
Configuration	R

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config					R			
v (vph)					180			
C(m) (vph)					585			
v/c					0.31			
95% queue length					1.32			
Control Delay					13.9			
LOS					B			
Approach Delay				13.9				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023
Analysis Time Period:	Pico Tarde
Intersection:	A
Jurisdiction:	DER/DF
Units: U. S. Metric	
Analysis Year:	2023
Project ID:	
East/West Street:	MOV01-MOV04
North/South Street:	MOV04
Intersection Orientation: EW	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		731	154			
Peak-Hour Factor, PHF		0.91	0.91			
Peak-15 Minute Volume		201	42			
Hourly Flow Rate, HFR		803	169			
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		2	0			
Configuration		T	TR			
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume			164			
Peak Hour Factor, PHF			0.91			
Peak-15 Minute Volume			45			
Hourly Flow Rate, HFR			180			
Percent Heavy Vehicles			0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized			No			
Lanes			1			
Configuration			R			

Pedestrian Volumes and Adjustments

Movements	13	14	15	16

Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)					6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)					0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)					0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage					6.2			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)					3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)					0			
t(f)					3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				

beta		
Travel time, t(a) (sec)		
Smoothing Factor, F		
Proportion of conflicting flow, f		
Max platooned flow, V(c,max)		
Min platooned flow, V(c,min)		
Duration of blocked period, t(p)		
Proportion time blocked, p	0.000	0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x					486			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	486	
Potential Capacity	585	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	585	
Probability of Queue free St.	0.69	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11

Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.69
Movement Capacity		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.69
Movement Capacity		

Results for Two-stage process:		
a		
y		

C t

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)			180			
Movement Capacity (vph)			585			
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep			585			
Volume			180			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config					R			
v (vph)					180			
C(m) (vph)					585			
v/c					0.31			
95% queue length					1.32			
Control Delay					13.9			
LOS					B			
Approach Delay				13.9				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

1.1.4.3 Interseção B – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: B
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL

East/West Street: M2
North/South Street: M7
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				24		
Peak-Hour Factor, PHF				0.91	0.91	
Hourly Flow Rate, HFR				26	795	
Percent Heavy Vehicles		--	--	12	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration				LT	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	13					
Peak Hour Factor, PHF	0.91					
Hourly Flow Rate, HFR	14					
Percent Heavy Vehicles	0					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1					
Configuration	L					

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		26	14					
C(m) (vph)		1560	561					
v/c		0.02	0.02					
95% queue length		0.05	0.08					
Control Delay		7.3	11.6					
LOS		A	B					
Approach Delay			11.6					
Approach LOS			B					

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: B
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M2
North/South Street: M7
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R

Volume					24			
Peak-Hour Factor, PHF					0.91	0.91		
Peak-15 Minute Volume					7	199		
Hourly Flow Rate, HFR					26	795		
Percent Heavy Vehicles		--	--		12	--	--	
Median Type/Storage	Undivided				/			
RT Channelized?								
Lanes					0	2		
Configuration					LT	T		
Upstream Signal?		No				No		

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	13					
Peak Hour Factor, PHF	0.91					
Peak-15 Minute Volume	4					
Hourly Flow Rate, HFR	14					
Percent Heavy Vehicles	0					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes	1					
Configuration	L					

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		12	0					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.2	6.4					
2-stage								

Follow-Up Time Calculations

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R

t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		12	0					
t(f)		2.3	3.5					

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5

Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		0	449					
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								

s	3000	
P(x)		
V(c,u,x)		
C(r,x)		
C(plat,x)		

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	0	
Potential Capacity	1560	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1560	
Probability of Queue free St.	0.98	1.00
Maj L-Shared Prob Q free St.	0.98	

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	449	
Potential Capacity	571	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.98	0.99
Movement Capacity	561	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	449	
Potential Capacity	571	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.98	0.99
Movement Capacity	561	
Results for Two-stage process:		
a		
y		
C t	561	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	14					
Movement Capacity (vph)	561					
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	561					
Volume	14					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		26	14					
C(m) (vph)		1560	561					
v/c		0.02	0.02					
95% queue length		0.05	0.08					
Control Delay		7.3	11.6					
LOS		A	B					
Approach Delay				11.6				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

1.1.4.4 Interseção B – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023
Analysis Time Period:	Pico Tarde
Intersection:	B
Jurisdiction:	DER/DF
Units: U. S. Metric	
Analysis Year:	2023
Project ID:	FUTURA COMERCIAL
East/West Street:	M2
North/South Street:	M7
Intersection Orientation: EW	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				12	2153	
Peak-Hour Factor, PHF				0.91	0.91	
Hourly Flow Rate, HFR				13	2365	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration				LT	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	171					
Peak Hour Factor, PHF	0.91					
Hourly Flow Rate, HFR	187					
Percent Heavy Vehicles	20					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
Lanes	1					
Configuration	L					

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		13	187					
C(m) (vph)		1636	185					
v/c		0.01	1.01					
95% queue length		0.02	17.26					
Control Delay		7.2	222.6					
LOS		A	F					
Approach Delay			222.6					
Approach LOS			F					

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: B
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M2
North/South Street: M7
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				12	2153	
Peak-Hour Factor, PHF				0.91	0.91	
Peak-15 Minute Volume				3	591	
Hourly Flow Rate, HFR				13	2365	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration					LT T	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	171					
Peak Hour Factor, PHF	0.91					
Peak-15 Minute Volume	47					
Hourly Flow Rate, HFR	187					
Percent Heavy Vehicles	20					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes	1					
Configuration	L					

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	20					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.6					
2-stage								

Follow-Up Time Calculations

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	20					
t(f)		2.2	3.7					

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor	(1) Single-stage	(2) Two-Stage Process	(3)

movements, p(x)	Process	Stage I	Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5								
Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		0	1208					
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		3000						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	0	
Potential Capacity	1636	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1636	
Probability of Queue free St.	0.99	1.00
Maj L-Shared Prob Q free St.	0.99	

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	1208	
Potential Capacity	186	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	185	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	1208	
Potential Capacity	186	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	185	
Results for Two-stage process:		
a		
y		
C t	185	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	187					
Movement Capacity (vph)	185					
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	185					
Volume	187					

Delay
Q sep
Q sep +1
round (Qsep +1)

---

n max
C sh
SUM C sep
n
C act

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		13	187					
C(m) (vph)		1636	185					
v/c		0.01	1.01					
95% queue length		0.02	17.26					
Control Delay		7.2	222.6					
LOS		A	F					
Approach Delay				222.6				
Approach LOS				F				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		7.2
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

1.1.4.5 Interseção C – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: C
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: MOV01-MOV05-MOV07
North/South Street: MOV08
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	39	1812				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	42	1991				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street: Approach	Northbound	Southbound

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				9		
Peak Hour Factor, PHF				0.91		
Hourly Flow Rate, HFR				9		
Percent Heavy Vehicles				12		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		
Configuration				L		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	42					9		
C(m) (vph)	1636					225		
v/c	0.03					0.04		
95% queue length	0.08					0.12		
Control Delay	7.3					21.7		
LOS	A					C		
Approach Delay							21.7	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: C
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: MOV01-MOV05-MOV07
North/South Street: MOV08
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	39	1812				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	11	498				
Hourly Flow Rate, HFR	42	1991				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	2				
Configuration	LT	T				
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				9		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				2		
Hourly Flow Rate, HFR				9		
Percent Heavy Vehicles				12		

Percent Grade (%)		0		0
Flared Approach: Exists?/Storage		/		/
RT Channelized				
Lanes		1		
Configuration		L		

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					12		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.5		
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					12		
t(f)	2.2					3.6		

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				

g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	0					1079		
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						3000		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1

Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	0.97
Maj L-Shared Prob Q free St.		0.97

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		1079
Potential Capacity		231
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.97
Movement Capacity		225

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		1079
Potential Capacity		231

Pedestrian Impedance Factor	1.00		1.00
Maj. L, Min T Impedance factor	0.97		
Maj. L, Min T Adj. Imp Factor.	0.98		
Cap. Adj. factor due to Impeding mvmnt	0.98		0.97
Movement Capacity			225

Results for Two-stage process:	
a	
y	
C t	225

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				9		
Movement Capacity (vph)				225		
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				225		
Volume				9		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	42					9		
C(m) (vph)	1636					225		
v/c	0.03					0.04		
95% queue length	0.08					0.12		
Control Delay	7.3					21.7		
LOS	A					C		
Approach Delay							21.7	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(il), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
d(M,LT), Delay for stream 1 or 4	7.3	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

1.1.4.6 Interseção C – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: C
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTUR COMERCIAL
East/West Street: MOV01-MOV05-MOV07
North/South Street: MOV08
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	29	855				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	31	939				
Percent Heavy Vehicles	21	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration		LT	T			
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				12		
Peak Hour Factor, PHF				0.91		
Hourly Flow Rate, HFR				13		
Percent Heavy Vehicles				0		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		
Configuration				L		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	31					13		
C(m) (vph)	1507					501		
v/c	0.02					0.03		
95% queue length	0.06					0.08		
Control Delay	7.4					12.4		
LOS	A					B		
Approach Delay							12.4	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: C
Jurisdiction: DER/DF
Units: U. S. Metric

Analysis Year: 2023
Project ID: FUTUR COMERCIAL
East/West Street: MOV01-MOV05-MOV07
North/South Street: MOV08
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	29	855				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	8	235				
Hourly Flow Rate, HFR	31	939				
Percent Heavy Vehicles	21	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				12		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				3		
Hourly Flow Rate, HFR				13		
Percent Heavy Vehicles				0		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes				1		
Configuration				L		

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2	Left-Turn						
	Through						
S5	Left-Turn						
	Through						

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	21					0		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00

t(3,lt)		0.00					0.70		
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.3					6.4		
	2-stage								

Follow-Up Time Calculations

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)	2.20					3.50		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	21					0		
t(f)	2.4					3.5		

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	0					531		
s								
Px								
V c,u,x								

C r,x								
C plat,x								
Two-Stage Process								
	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s					3000			
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1507
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1507
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.98
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		531
Potential Capacity		512
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		501

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		

Result for 2 stage process:	
a	
y	
C t	
Probability of Queue free St.	1.00 1.00

Step 4: LT from Minor St.	7 10

Part 1 - First Stage	
Conflicting Flows	
Potential Capacity	
Pedestrian Impedance Factor	
Cap. Adj. factor due to Impeding mvmnt	
Movement Capacity	

Part 2 - Second Stage	
Conflicting Flows	
Potential Capacity	
Pedestrian Impedance Factor	
Cap. Adj. factor due to Impeding mvmnt	
Movement Capacity	

Part 3 - Single Stage		
Conflicting Flows		531
Potential Capacity		512
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		501

Results for Two-stage process:	
a	
y	
C t	501

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				13		
Movement Capacity (vph)				501		
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				501		
Volume				13		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	31					13		
C(m) (vph)	1507					501		
v/c	0.02					0.03		

95% queue length	0.06	0.08	
Control Delay	7.4	12.4	
LOS	A	B	
Approach Delay			12.4
Approach LOS			B

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
d(M,LT), Delay for stream 1 or 4	7.4	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

1.1.4.7 Interseção D – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023
Analysis Time Period:	Pico Manha
Intersection:	D
Jurisdiction:	DER/DF
Units: U. S. Metric	
Analysis Year:	2023
Project ID:	FUTURA COMERCIAL
East/West Street:	MOV01-MOV05-MOV07
North/South Street:	MOV06
Intersection Orientation: EW	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		1790	48			
Peak-Hour Factor, PHF		0.91	0.91			
Hourly Flow Rate, HFR		1967	52			
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		2	0			
Configuration		T	TR			
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume			15			
Peak Hour Factor, PHF			0.91			
Hourly Flow Rate, HFR			16			
Percent Heavy Vehicles			34			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes			1			
Configuration			R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config					R			

v (vph)		16
C(m) (vph)		253
v/c		0.06
95% queue length		0.20
Control Delay		20.2
LOS		C
Approach Delay	20.2	
Approach LOS	C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: D
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: MOV01-MOV05-MOV07
North/South Street: MOV06
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		1790	48			
Peak-Hour Factor, PHF		0.91	0.91			
Peak-15 Minute Volume		492	13			
Hourly Flow Rate, HFR		1967	52			
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		2	0			
Configuration		T	TR			
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume			15			
Peak Hour Factor, PHF			0.91			
Peak-15 Minute Volume			4			
Hourly Flow Rate, HFR			16			
Percent Heavy Vehicles			34			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized			No			
Lanes			1			
Configuration			R			

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)					6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)					34			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)					0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage					6.5			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)					3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)					34			
t(f)					3.6			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x					1010			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	1010	
Potential Capacity	253	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	253	
Probability of Queue free St.	0.94	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.94
Movement Capacity		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.94
Movement Capacity		
Results for Two-stage process:		
a		
y		
C t		

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R

Volume (vph)						16					
Movement Capacity (vph)						253					
Shared Lane Capacity (vph)											

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep			253			
Volume			16			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config					R			
v (vph)					16			
C(m) (vph)					253			
v/c					0.06			
95% queue length					0.20			
Control Delay					20.2			
LOS					C			
Approach Delay				20.2				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

1.1.4.8 Interseção D – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023
Analysis Time Period:	Pico Tarde
Intersection:	D
Jurisdiction:	DER/DF
Units: U. S. Metric	
Analysis Year:	2023
Project ID:	FUTURA COMERCIAL
East/West Street:	MOV01-MOV05-MOV07
North/South Street:	MOV06
Intersection Orientation: EW	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Approach	Eastbound			Westbound		
	Movement	1	2	3	4	5	6
		L	T	R	L	T	R

Volume		703	154			
Peak-Hour Factor, PHF		0.91	0.91			
Hourly Flow Rate, HFR		772	169			
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		2	0			
Configuration		T	TR			
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume			164			
Peak Hour Factor, PHF			0.91			
Hourly Flow Rate, HFR			180			
Percent Heavy Vehicles			0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes			1			
Configuration			R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config					R			
v (vph)					180			
C(m) (vph)					598			
v/c					0.30			
95% queue length					1.28			
Control Delay					13.6			
LOS					B			
Approach Delay				13.6				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: D
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: MOV01-MOV05-MOV07
North/South Street: MOV06
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		703	154			
Peak-Hour Factor, PHF		0.91	0.91			
Peak-15 Minute Volume		193	42			
Hourly Flow Rate, HFR		772	169			
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						

Lanes		2	0			
Configuration		T	TR			
Upstream Signal?		No		No		

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume			164			
Peak Hour Factor, PHF			0.91			
Peak-15 Minute Volume			45			
Hourly Flow Rate, HFR			180			
Percent Heavy Vehicles			0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized			No			
Lanes			1			
Configuration			R			

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)					6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)					0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)					0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage					6.2			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)					3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)					0			
t(f)					3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x					470			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	470	
Potential Capacity	598	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	598	
Probability of Queue free St.	0.70	1.00
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.70
Movement Capacity		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		

Movement Capacity

Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						

Part 3 - Single Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					1.00	
Maj. L, Min T Adj. Imp Factor.					1.00	
Cap. Adj. factor due to Impeding mvmnt			1.00		0.70	
Movement Capacity						

Results for Two-stage process:						
a						
y						
C t						

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)			180			
Movement Capacity (vph)			598			
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep			598			
Volume			180			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config					R			
v (vph)					180			
C(m) (vph)					598			
v/c					0.30			
95% queue length					1.28			
Control Delay					13.6			
LOS					B			
Approach Delay				13.6				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		

d(M,LT), Delay for stream 1 or 4
N, Number of major street through lanes
d(rank,1) Delay for stream 2 or 5

1.1.4.9 *Interseção E – Pico Manhã*

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection:
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M2-M7+M8-M11+M12-M13
North/South Street: M13
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				5	733	
Peak-Hour Factor, PHF				0.91	0.91	
Hourly Flow Rate, HFR				5	805	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes				0	2	
Configuration					LT T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	21					
Peak Hour Factor, PHF	0.91					
Hourly Flow Rate, HFR	23					
Percent Heavy Vehicles	11					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1					
Configuration	L					

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		5	23					
C(m) (vph)		1636	577					
v/c		0.00	0.04					
95% queue length		0.01	0.12					
Control Delay		7.2	11.5					
LOS		A	B					
Approach Delay			11.5					
Approach LOS			B					

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection:
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M2-M7+M8-M11+M12-M13
North/South Street: M13
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume				5	733	
Peak-Hour Factor, PHF				0.91	0.91	
Peak-15 Minute Volume				1	201	
Hourly Flow Rate, HFR				5	805	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration					LT T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	21					
Peak Hour Factor, PHF	0.91					
Peak-15 Minute Volume	6					
Hourly Flow Rate, HFR	23					
Percent Heavy Vehicles	11					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes	1					
Configuration	L					

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	11					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.5					
2-stage								

Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	11					
t(f)		2.2	3.6					

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			

p(11)
p(12)

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		0	412					
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		3000						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	0	
Potential Capacity	1636	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1636	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	412	
Potential Capacity	579	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	577	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	412	
Potential Capacity	579	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	577	
Results for Two-stage process:		
a		
y		
C t	577	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	23					
Movement Capacity (vph)	577					
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	577					
Volume	23					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						

n
C act

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		5	23					
C(m) (vph)		1636	577					
v/c		0.00	0.04					
95% queue length		0.01	0.12					
Control Delay		7.2	11.5					
LOS		A	B					
Approach Delay				11.5				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.2
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

1.1.4.10 Interseção E – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: E
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M2-M7+M8-M11
North/South Street: M11
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				4	2120	
Peak-Hour Factor, PHF				0.91	0.91	
Hourly Flow Rate, HFR				4	2329	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration				LT	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	164					
Peak Hour Factor, PHF						
Hourly Flow Rate, HFR	180					
Percent Heavy Vehicles	0					
Percent Grade (%)		0			0	

Flared Approach: Exists?/Storage		/	/
Lanes	1		
Configuration	L		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		4	180					
C(m) (vph)		1636	214					
v/c		0.00	0.84					
95% queue length		0.01	10.00					
Control Delay		7.2	93.1					
LOS		A	F					
Approach Delay				93.1				
Approach LOS				F				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023
Analysis Time Period:	Pico Tarde
Intersection:	E
Jurisdiction:	DER/DF
Units: U. S. Metric	
Analysis Year:	2023
Project ID:	FUTURA COMERCIAL
East/West Street:	M2-M7+M8-M11
North/South Street:	M11
Intersection Orientation: EW	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				4	2120	
Peak-Hour Factor, PHF				0.91	0.91	
Peak-15 Minute Volume				1	582	
Hourly Flow Rate, HFR				4	2329	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration					LT T	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	164					
Peak Hour Factor, PHF						
Peak-15 Minute Volume	45					
Hourly Flow Rate, HFR	180					
Percent Heavy Vehicles	0					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes	1					
Configuration	L					

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.4					
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0					
t(f)		2.2	3.5					

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)

alpha	
beta	
Travel time, t(a) (sec)	
Smoothing Factor, F	
Proportion of conflicting flow, f	
Max platooned flow, V(c,max)	
Min platooned flow, V(c,min)	
Duration of blocked period, t(p)	
Proportion time blocked, p	0.000 0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		0	1172					
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		3000						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	0	
Potential Capacity	1636	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1636	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	

Step 3: TH from Minor St.	8	11

Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Conflicting Flows	1172	
Potential Capacity	215	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	214	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows	1172	
Potential Capacity	215	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	214	

Results for Two-stage process:		
a		

y
C t 214

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	180					
Movement Capacity (vph)	214					
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	214					
Volume	180					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		4	180					
C(m) (vph)		1636	214					
v/c		0.00	0.84					
95% queue length		0.01	10.00					
Control Delay		7.2	93.1					
LOS		A	F					
Approach Delay				93.1				
Approach LOS				F				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.2
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

1.1.4.11 Interseção F – Pico Manhã

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TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: F
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023

Project ID: FUTURA COMERCIAL
East/West Street: M01-M05-M07+M08+M06-M11
North/South Street: M12
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9	1959				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	9	2152				
Percent Heavy Vehicles	12	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration		LT	T			
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				5		
Peak Hour Factor, PHF				0.91		
Hourly Flow Rate, HFR				5		
Percent Heavy Vehicles				0		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		
Configuration				L		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	9					5		
C(m) (vph)	1560					238		
v/c	0.01					0.02		
95% queue length	0.02					0.06		
Control Delay	7.3					20.5		
LOS	A					C		
Approach Delay							20.5	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: F
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M01-M05-M07+M08+M06-M11
North/South Street: M12
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6

	L	T	R	L	T	R
Volume	9	1959				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	2	538				
Hourly Flow Rate, HFR	9	2152				
Percent Heavy Vehicles	12	--	--		--	--
Median Type/Storage RT Channelized?	Undivided		/			
Lanes	0	2				
Configuration	LT	T				
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				5		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				1		
Hourly Flow Rate, HFR				5		
Percent Heavy Vehicles				0		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage RT Channelized				/		/
Lanes				1		
Configuration				L		

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)	4.1					7.1		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	12					0		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.2					6.4		
2-stage								

Follow-Up Time Calculations

Movement	1	4	7	8	9	10	11	12

	L	L	L	T	R	L	T	R
t(f,base)	2.20					3.50		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	12					0		
t(f)	2.3					3.5		

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	0					1094		
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2

V(c,x)		
s	3000	
P(x)		
V(c,u,x)		
C(r,x)		
C(plat,x)		

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1560
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1560
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		1094
Potential Capacity		239
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity		238

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		

Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		1094
Potential Capacity		239
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity		238
Results for Two-stage process:		
a		
y		
C t		238

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				5		
Movement Capacity (vph)				238		
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				238		
Volume				5		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	9					5		
C(m) (vph)	1560					238		
v/c	0.01					0.02		
95% queue length	0.02					0.06		
Control Delay	7.3					20.5		
LOS	A					C		
Approach Delay							20.5	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(il), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.3	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

1.1.4.12 Interseção F – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023
Analysis Time Period:	Pico Tarde
Intersection:	F
Jurisdiction:	DER/DF
Units: U. S. Metric	
Analysis Year:	2023
Project ID:	FUTURA COMERCIAL
East/West Street:	M01-M05-M07+M08+M06-M11
North/South Street:	M12
Intersection Orientation: EW	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	861				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	6	946				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				4		
Peak Hour Factor, PHF				0.91		
Hourly Flow Rate, HFR				4		
Percent Heavy Vehicles				0		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
Lanes				1		
Configuration				L		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	6					4		
C(m) (vph)	1636					543		
v/c	0.00					0.01		
95% queue length	0.01					0.02		
Control Delay	7.2					11.7		
LOS	A					B		
Approach Delay							11.7	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: F
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M01-M05-M07+M08+M06-M11
North/South Street: M12
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	6	861				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	2	237				
Hourly Flow Rate, HFR	6	946				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				4		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				1		
Hourly Flow Rate, HFR				4		
Percent Heavy Vehicles				0		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes				1		
Configuration				L		

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0					0		
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1					6.4		
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		
t(f)	2.2					3.5		

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked	(1)	(2)	(3)

for minor movements, p(x)	Single-stage Process	Two-Stage Process Stage I	Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	0					485		
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						3000		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		1.00
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		485
Potential Capacity		545
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		543

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		485
Potential Capacity		545
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		543
Results for Two-stage process:		
a		
y		
C t		543

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				4		
Movement Capacity (vph)				543		
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				543		

Volume								4			
Delay											
Q sep											
Q sep +1											
round (Qsep +1)											

n max											
C sh											
SUM C sep											
n											
C act											

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	6					4		
C(m) (vph)	1636					543		
v/c	0.00					0.01		
95% queue length	0.01					0.02		
Control Delay	7.2					11.7		
LOS	A					B		
Approach Delay							11.7	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	1.00	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

1.1.4.13 Interseção G – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023
Analysis Time Period:	Pico Manha
Intersection:	G
Jurisdiction:	DER/DF
Units: U. S. Metric	
Analysis Year:	2023
Project ID:	FUTURA COMERCIAL
East/West Street:	M2-M7+M8-M11+M12-M13
North/South Street:	M13
Intersection Orientation: EW	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Approach	Eastbound			Westbound		
	Movement	1	2	3	4	5	6
		L	T	R	L	T	R
Volume					30	736	
Peak-Hour Factor, PHF					0.91	0.91	
Hourly Flow Rate, HFR					32	808	
Percent Heavy Vehicles			--	--	4	--	--
Median Type/Storage		Undivided			/		
RT Channelized?							
Lanes					0	2	

Configuration						LT	T	
Upstream Signal?		No					No	

Minor Street:	Approach	Northbound			Southbound		
	Movement	7	8	9	10	11	12
		L	T	R	L	T	R
Volume		17					
Peak Hour Factor, PHF		1.00					
Hourly Flow Rate, HFR		17					
Percent Heavy Vehicles		0					
Percent Grade (%)			0			0	
Flared Approach:	Exists?/Storage			/			/
Lanes		1					
Configuration		L					

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		32	17					
C(m) (vph)		1610	546					
v/c		0.02	0.03					
95% queue length		0.06	0.10					
Control Delay		7.3	11.8					
LOS		A	B					
Approach Delay				11.8				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: G
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M2-M7+M8-M11+M12-M13
North/South Street: M13
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				30	736	
Peak-Hour Factor, PHF				0.91	0.91	
Peak-15 Minute Volume				8	202	
Hourly Flow Rate, HFR				32	808	
Percent Heavy Vehicles		--	--	4	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration					LT	T
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	17					

Peak Hour Factor, PHF	1.00							
Peak-15 Minute Volume	4							
Hourly Flow Rate, HFR	17							
Percent Heavy Vehicles	0							
Percent Grade (%)		0				0		
Flared Approach: Exists?/Storage			/				/	
RT Channelized								
Lanes		1						
Configuration		L						

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		4	0					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.4					
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		4	0					
t(f)		2.2	3.5					

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				

Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		0	468					
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s	3000							
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations		
Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		

Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows	0	
Potential Capacity	1610	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1610	
Probability of Queue free St.	0.98	1.00
Maj L-Shared Prob Q free St.	0.98	
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows	468	
Potential Capacity	557	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	546	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage			
Conflicting Flows	468		
Potential Capacity	557		
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor		0.98	
Maj. L, Min T Adj. Imp Factor.		0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98	
Movement Capacity	546		

Results for Two-stage process:	
a	
y	
C t	546

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	17					
Movement Capacity (vph)	546					
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	546					
Volume	17					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		32	17					
C(m) (vph)		1610	546					
v/c		0.02	0.03					
95% queue length		0.06	0.10					
Control Delay		7.3	11.8					
LOS		A	B					
Approach Delay				11.8				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

1.1.4.14 Interseção G – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: G
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M2-M7+M8-M11+M12-M13
North/South Street: M13
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				35	2123	
Peak-Hour Factor, PHF				0.91	0.91	
Hourly Flow Rate, HFR				38	2332	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration				LT	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	170					
Peak Hour Factor, PHF	0.91					
Hourly Flow Rate, HFR	186					
Percent Heavy Vehicles	0					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1					
Configuration	L					

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		38	186					
C(m) (vph)		1636	190					
v/c		0.02	0.98					
95% queue length		0.07	15.73					
Control Delay		7.3	188.7					
LOS		A	F					
Approach Delay			188.7					
Approach LOS			F					

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan

Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: G
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M2-M7+M8-M11+M12-M13
North/South Street: M13
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume				35	2123	
Peak-Hour Factor, PHF				0.91	0.91	
Peak-15 Minute Volume				10	583	
Hourly Flow Rate, HFR				38	2332	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration				LT	T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	170					
Peak Hour Factor, PHF	0.91					
Peak-15 Minute Volume	47					
Hourly Flow Rate, HFR	186					
Percent Heavy Vehicles	0					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes	1					
Configuration	L					

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R

t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.4					
2-stage								

Follow-Up Time Calculations

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0					
t(f)		2.2	3.5					

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12

	L	L	L	T	R	L	T	R
V c,x	0	1242						
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		3000						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows	0	
Potential Capacity	1636	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1636	
Probability of Queue free St.	0.98	1.00
Maj L-Shared Prob Q free St.	0.98	
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows	1242	
Potential Capacity	195	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	190	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		

Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows	1242		
Potential Capacity	195		
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor		0.98	
Maj. L, Min T Adj. Imp Factor.		0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98	
Movement Capacity	190		
Results for Two-stage process:			
a			
y			
C t	190		

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	186					
Movement Capacity (vph)	190					
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	190					
Volume	186					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		38	186					
C(m) (vph)		1636	190					
v/c		0.02	0.98					
95% queue length		0.07	15.73					
Control Delay		7.3	188.7					
LOS		A	F					
Approach Delay				188.7				
Approach LOS				F				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

1.1.4.15 Interseção H – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: H
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M01-M05-M07+M08+M06-M11+M12
North/South Street: M14
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	1784				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	1	1960				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				30		
Peak Hour Factor, PHF				0.91		
Hourly Flow Rate, HFR				32		
Percent Heavy Vehicles				4		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
Lanes					1	
Configuration					L	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	1					32		
C(m) (vph)	1636					274		
v/c	0.00					0.12		
95% queue length	0.00					0.40		
Control Delay	7.2					19.9		
LOS	A					C		
Approach Delay							19.9	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: H
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M01-M05-M07+M08+M06-M11+M12
North/South Street: M14
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	1784				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	0	490				
Hourly Flow Rate, HFR	1	1960				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				30		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				8		
Hourly Flow Rate, HFR				32		
Percent Heavy Vehicles				4		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes				1		
Configuration				L		

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2	Left-Turn						
	Through						
S5	Left-Turn						
	Through						

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					4		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.4		
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					4		
t(f)	2.2					3.5		

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				

Min platooned flow, V(c,min)		
Duration of blocked period, t(p)		
Proportion time blocked, p	0.000	0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	0					982		
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						3000		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		

Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		982
Potential Capacity		274
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		274

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		982
Potential Capacity		274
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		274
Results for Two-stage process:		
a		
y		
C t		274

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				32		
Movement Capacity (vph)				274		
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				274		
Volume				32		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	1					32		
C(m) (vph)	1636					274		
v/c	0.00					0.12		
95% queue length	0.00					0.40		
Control Delay	7.2					19.9		
LOS	A					C		
Approach Delay							19.9	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	1.00	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

1.1.4.16 Interseção H – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: H
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M01-M05-M07+M08+M06-M11+M12
North/South Street: M14

Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	865				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	6	950				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration	LT	T				
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				35		
Peak Hour Factor, PHF				0.91		
Hourly Flow Rate, HFR				38		
Percent Heavy Vehicles				0		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		
Configuration				L		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	6					38		
C(m) (vph)	1636					541		
v/c	0.00					0.07		
95% queue length	0.01					0.23		
Control Delay	7.2					12.2		
LOS	A					B		
Approach Delay							12.2	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: H
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: M01-M05-M07+M08+M06-M11+M12
North/South Street: M14
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	865				

Peak-Hour Factor, PHF	0.91	0.91									
Peak-15 Minute Volume	2	238									
Hourly Flow Rate, HFR	6	950									
Percent Heavy Vehicles	0	--		--				--		--	
Median Type/Storage	Undivided			/							
RT Channelized?											
Lanes	0	2									
Configuration		LT	T								
Upstream Signal?		No					No				

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				35		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				10		
Hourly Flow Rate, HFR				38		
Percent Heavy Vehicles				0		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes				1		
Configuration				L		

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0					0		
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1					6.4		
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		

t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		
t(f)	2.2					3.5		

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	0					487		
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						3000		
P(x)								

V(c,u,x)

C(r,x)
C(plat,x)

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		1.00
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		487
Potential Capacity		543
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		541

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10

Part 1 - First Stage												
Conflicting Flows												
Potential Capacity												
Pedestrian Impedance Factor												
Cap. Adj. factor due to Impeding mvmnt												
Movement Capacity												
Part 2 - Second Stage												
Conflicting Flows												
Potential Capacity												
Pedestrian Impedance Factor												
Cap. Adj. factor due to Impeding mvmnt												
Movement Capacity												
Part 3 - Single Stage												
Conflicting Flows											487	
Potential Capacity											543	
Pedestrian Impedance Factor							1.00				1.00	
Maj. L, Min T Impedance factor							1.00					
Maj. L, Min T Adj. Imp Factor.							1.00					
Cap. Adj. factor due to Impeding mvmnt							1.00				1.00	
Movement Capacity											541	
Results for Two-stage process:												
a												
y												
C t											541	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				38		
Movement Capacity (vph)				541		
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				541		
Volume				38		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	6					38		
C(m) (vph)	1636					541		
v/c	0.00					0.07		
95% queue length	0.01					0.23		
Control Delay	7.2					12.2		
LOS	A					B		
Approach Delay							12.2	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5

p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	1.00	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

1.1.4.17 Interseção I – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023
Analysis Time Period:	Pico Manha
Intersection:	I
Jurisdiction:	DER/DF
Units: U. S. Metric	
Analysis Year:	2023
Project ID:	FUTURA COMERCIAL
East/West Street:	MOV01-MOV04-MOV10
North/South Street:	MOV10
Intersection Orientation: EW	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	14	1780				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	15	1956				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				48		
Peak Hour Factor, PHF				0.91		
Hourly Flow Rate, HFR				52		
Percent Heavy Vehicles				17		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		
Configuration				L		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	15					52		
C(m) (vph)	1636					248		
v/c	0.01					0.21		
95% queue length	0.03					0.79		
Control Delay	7.2					23.4		
LOS	A					C		
Approach Delay							23.4	
Approach LOS							C	

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Manha
Intersection: I
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: MOV01-MOV04-MOV10
North/South Street: MOV10
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	14	1780				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	4	489				
Hourly Flow Rate, HFR	15	1956				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				48		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				13		
Hourly Flow Rate, HFR				52		
Percent Heavy Vehicles				17		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes				1		
Configuration				L		

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5

Shared ln volume, major th vehicles:	0
Shared ln volume, major rt vehicles:	0
Sat flow rate, major th vehicles:	1700
Sat flow rate, major rt vehicles:	1700
Number of major street through lanes:	2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0					17		
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1					6.6		
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					17		
t(f)	2.2					3.7		

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				
g(q2)				
g(q)				

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II

p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	0					1008		
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						3000		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		1008
Potential Capacity		250
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		248

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11

Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						
Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Part 3 - Single Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor				1.00		1.00
Cap. Adj. factor due to Impeding mvmnt				0.99		0.99
Movement Capacity						
Result for 2 stage process:						
a						
y						
C t						
Probability of Queue free St.				1.00		1.00
Step 4: LT from Minor St.				7		10
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Part 3 - Single Stage						
Conflicting Flows						1008
Potential Capacity						250
Pedestrian Impedance Factor				1.00		1.00
Maj. L, Min T Impedance factor				0.99		
Maj. L, Min T Adj. Imp Factor.				0.99		
Cap. Adj. factor due to Impeding mvmnt				0.99		0.99
Movement Capacity						248
Results for Two-stage process:						
a						
y						
C t						248

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				52		
Movement Capacity (vph)				248		
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				248		
Volume				52		
Delay						
Q sep						

Q sep +1
round (Qsep +1)

---

n max
C sh
SUM C sep
n
C act

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	15					52		
C(m) (vph)	1636					248		
v/c	0.01					0.21		
95% queue length	0.03					0.79		
Control Delay	7.2					23.4		
LOS	A					C		
Approach Delay							23.4	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(il), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

1.1.4.18 Interseção I – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: I
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: MOV01-MOV04-MOV10
North/South Street: MOV10
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	707				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	6	776				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12

	L	T	R	L	T	R
Volume				164		
Peak Hour Factor, PHF				0.91		
Hourly Flow Rate, HFR				180		
Percent Heavy Vehicles				6		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		
Configuration				L		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	6					180		
C(m) (vph)	1636					596		
v/c	0.00					0.30		
95% queue length	0.01					1.29		
Control Delay	7.2					13.6		
LOS	A					B		
Approach Delay							13.6	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan
Agency/Co.:
Date Performed: 05/06/2023
Analysis Time Period: Pico Tarde
Intersection: I
Jurisdiction: DER/DF
Units: U. S. Metric
Analysis Year: 2023
Project ID: FUTURA COMERCIAL
East/West Street: MOV01-MOV04-MOV10
North/South Street: MOV10
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	707				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	2	194				
Hourly Flow Rate, HFR	6	776				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	2				
Configuration	LT	T				
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				164		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				45		
Hourly Flow Rate, HFR				180		
Percent Heavy Vehicles				6		
Percent Grade (%)		0			0	

Flared Approach: Exists?/Storage		/	/
RT Channelized			
Lanes		1	
Configuration		L	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					6		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.5		
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					6		
t(f)	2.2					3.6		

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green P				
g(q1)				

g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	0					400		
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						3000		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations		
Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		0