HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/25/2005
Analysis Time Period: 7:30am - 8:30am
Intersection: Troy Road
Jurisdiction: Tompkins County
Units: U. S. Metric
Analysis Year: 2027
Project ID: Coddington Road (4024)
East/West Street: Troy Road
North/South Street: Coddington Road
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	122			50	17
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	0	135			55	18
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				68		2
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				75		2
Percent Heavy Vehicles				4		4
Percent Grade (%)		0			-3	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	0						77	
C(m) (vph)	1514						789	
v/c	0.00						0.10	
95% queue length	0.00						0.32	
Control Delay	7.4						10.1	
LOS	A						B	
Approach Delay							10.1	
Approach LOS							B	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	S.P.W.
Agency/Co.:	Dewberry-Goodkind, Inc.
Date Performed:	8/25/2005
Analysis Time Period:	7:30am - 8:30am
Intersection:	Troy Road
Jurisdiction:	Tompkins County
Units: U. S. Metric	
Analysis Year:	2027
Project ID: Coddington Road (4024)	
East/West Street:	Troy Road
North/South Street:	Coddington Road
Intersection Orientation: NS	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	0	122			50	17
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Peak-15 Minute Volume	0	34			14	5
Hourly Flow Rate, HFR	0	135			55	18
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				68		2
Peak Hour Factor, PHF				0.90		0.90
Peak-15 Minute Volume				19		1
Hourly Flow Rate, HFR				75		2
Percent Heavy Vehicles				4		4
Percent Grade (%)		0			-3	
Flared Approach: Exists?/Storage				/		No /
RT Channelized						
Lanes				0		0
Configuration					LR	

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:	135	
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:	1	

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		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	4					4		4
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	-0.03	-0.03	-0.03
t(3,lt)	0.00					0.70		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	4.1					6.4		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)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	4					4		4
t(f)	2.2					3.5		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(1,prot)	V(t)	V(1,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	73					199		64
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						1500		
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						64		
Potential Capacity						995		
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity						995		
Probability of Queue free St.			1.00			1.00		
Step 2: LT from Major St.			**4**			**1**		
Conflicting Flows						73		
Potential Capacity						1514		
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity						1514		
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						199		
Potential Capacity						785		
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						785		

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		199
Potential Capacity		785
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		785
Results for Two-stage process:		
a		
y		
C t		785

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				75		2
Movement Capacity (vph)				785		995
Shared Lane Capacity (vph)					789	

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				785		995
Volume				75		2
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					789	
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						LR	
v (vph)	0						77	
C(m) (vph)	1514						789	
v/c	0.00						0.10	
95% queue length	0.00						0.32	
Control Delay	7.4						10.1	
LOS	A						B	
Approach Delay							10.1	
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	135	
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	7.4	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.0	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/25/2005
* Analysis Time Period: 5:00pm - 6:00pm
* Intersection: Troy Road
Jurisdiction: Tompkins County
Units: U. S. Metric
* Analysis Year: 2027
Project ID: Coddington Road (4024)
East/West Street: Troy Road
North/South Street: Coddington Road
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	79			120	70
Peak-Hour Factor, PHF	0.82	0.82			0.82	0.82
Hourly Flow Rate, HFR	7	96			146	85
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT				TR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				29		7
Peak Hour Factor, PHF				0.82		0.82
Hourly Flow Rate, HFR				35		8
Percent Heavy Vehicles				4		4
Percent Grade (%)		0			-3	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	7						43	
C(m) (vph)	1325						711	
v/c	0.01						0.06	
95% queue length	0.02						0.19	
Control Delay	7.7						10.4	
LOS	A						B	
Approach Delay							10.4	
Approach LOS							B	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/25/2005
Analysis Time Period: 5:00pm - 6:00pm
Intersection: Troy Road
Jurisdiction: Tompkins County
Units: U. S. Metric
Analysis Year: 2027
Project ID: Coddington Road (4024)
East/West Street: Troy Road
North/South Street: Coddington Road
Intersection Orientation: NS 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	79			120	70
Peak-Hour Factor, PHF	0.82	0.82			0.82	0.82
Peak-15 Minute Volume	2	24			37	21
Hourly Flow Rate, HFR	7	96			146	85
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				29		7
Peak Hour Factor, PHF				0.82		0.82
Peak-15 Minute Volume				9		2
Hourly Flow Rate, HFR				35		8
Percent Heavy Vehicles				4		4
Percent Grade (%)		0			-3	
Flared Approach: Exists?/Storage				/		No /
RT Channelized						
Lanes				0		0
Configuration					LR	

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:	96	
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:	1	

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		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	4					4		4
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	-0.03	-0.03	-0.03
t(3,lt)	0.00					0.70		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	4.1					6.4		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)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	4					4		4
t(f)	2.2					3.5		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) 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	231					298		188
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					1500			
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						188		
Potential Capacity						849		
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity						849		
Probability of Queue free St.			1.00			0.99		
Step 2: LT from Major St.			**4**			**1**		
Conflicting Flows						231		
Potential Capacity						1325		
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity						1325		
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						298		
Potential Capacity						689		
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			0.99			0.99		
Movement Capacity						685		

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		298
Potential Capacity		689
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	0.99	0.99
Movement Capacity		685
Results for Two-stage process:		
a		
y		
C t		685

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				35		8
Movement Capacity (vph)				685		849
Shared Lane Capacity (vph)					711	

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				685		849
Volume				35		8
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					711	
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						LR	
v (vph)	7						43	
C(m) (vph)	1325						711	
v/c	0.01						0.06	
95% queue length	0.02						0.19	
Control Delay	7.7						10.4	
LOS	A						B	
Approach Delay							10.4	
Approach LOS							B	

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	96	
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	7.7	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.0	

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/22/2005
* Analysis Time Period: 8:00am - 9.:00am
* Intersection: Ithaca College
Jurisdiction: Tompkins County
Units: U. S. Metric
* Analysis Year: 2005
Project ID: Coddington Road (4024)
East/West Street: Ithaca College Entrance
North/South Street: Coddington Road
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	26	51			39	48
Peak-Hour Factor, PHF	0.64	0.64			0.64	0.64
Hourly Flow Rate, HFR	40	79			60	75
Percent Heavy Vehicles	18	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				9		10
Peak Hour Factor, PHF				0.64		0.64
Hourly Flow Rate, HFR				14		15
Percent Heavy Vehicles				18		18
Percent Grade (%)		0			-5	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	40					14		15
C(m) (vph)	1356					678		916
v/c	0.03					0.02		0.02
95% queue length	0.09					0.06		0.05
Control Delay	7.7					10.4		9.0
LOS	A					B		A
Approach Delay							9.7	
Approach LOS							A	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/22/2005
Analysis Time Period: 8:00am - 9.:00am
Intersection: Ithaca College
Jurisdiction: Tompkins County
Units: U. S. Metric
Analysis Year: 2005
Project ID: Coddington Road (4024)
East/West Street: Ithaca College Entrance
North/South Street: Coddington Road
Intersection Orientation: NS 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	26	51			39	48
Peak-Hour Factor, PHF	0.64	0.64			0.64	0.64
Peak-15 Minute Volume	10	20			15	19
Hourly Flow Rate, HFR	40	79			60	75
Percent Heavy Vehicles	18	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				9		10
Peak Hour Factor, PHF				0.64		0.64
Peak-15 Minute Volume				4		4
Hourly Flow Rate, HFR				14		15
Percent Heavy Vehicles				18		18
Percent Grade (%)		0			-5	
Flared Approach: Exists?/Storage				/		/
RT Channelized						No
Lanes				1		1
Configuration				L		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:	79	
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:	1	

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		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	18					18		18
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	-0.05	-0.05	-0.05
t(3,lt)	0.00					0.70		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	4.3					6.6		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		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	18					18		18
t(f)	2.4					3.7		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	135					257		98
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					1500			
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		98
Potential Capacity		916
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		916
Probability of Queue free St.	1.00	0.98

Step 2: LT from Major St.	4	1
Conflicting Flows		135
Potential Capacity		1356
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1356
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		257
Potential Capacity		699
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	0.96	0.97
Movement Capacity		678

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		257	
Potential Capacity		699	
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	0.96	0.97	
Movement Capacity		678	
Results for Two-stage process:			
a			
y			
C t		678	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				14		15
Movement Capacity (vph)				678		916
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				678		916
Volume				14		15
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		R
v (vph)	40					14		15
C(m) (vph)	1356					678		916
v/c	0.03					0.02		0.02
95% queue length	0.09					0.06		0.05
Control Delay	7.7					10.4		9.0
LOS	A					B		A
Approach Delay							9.7	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(i1), Volume for stream 2 or 5	79	
v(i2), Volume for stream 3 or 6	0	
s(i1), 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	7.7	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.2	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/22/2005
* Analysis Time Period: 4:30pm - 5:30pm
* Intersection: Ithaca College
Jurisdiction: Tompkins County
Units: U. S. Metric
* Analysis Year: 2005
Project ID: Coddington Road (4024)
East/West Street: Ithaca College Entrance
North/South Street: Coddington Road
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	12	91			120	40
Peak-Hour Factor, PHF	0.81	0.81			0.81	0.81
Hourly Flow Rate, HFR	14	112			148	49
Percent Heavy Vehicles	18	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				57		47
Peak Hour Factor, PHF				0.81		0.81
Hourly Flow Rate, HFR				70		58
Percent Heavy Vehicles				18		18
Percent Grade (%)		0			-5	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	14					70		58
C(m) (vph)	1285					642		832
v/c	0.01					0.11		0.07
95% queue length	0.03					0.37		0.22
Control Delay	7.8					11.3		9.7
LOS	A					B		A
Approach Delay							10.5	
Approach LOS							B	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/22/2005
Analysis Time Period: 4:30pm - 5:30pm
Intersection: Ithaca College
Jurisdiction: Tompkins County
Units: U. S. Metric
Analysis Year: 2005
Project ID: Coddington Road (4024)
East/West Street: Ithaca College Entrance
North/South Street: Coddington Road
Intersection Orientation: NS 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	12	91			120	40
Peak-Hour Factor, PHF	0.81	0.81			0.81	0.81
Peak-15 Minute Volume	4	28			37	12
Hourly Flow Rate, HFR	14	112			148	49
Percent Heavy Vehicles	18	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				57		47
Peak Hour Factor, PHF				0.81		0.81
Peak-15 Minute Volume				18		15
Hourly Flow Rate, HFR				70		58
Percent Heavy Vehicles				18		18
Percent Grade (%)		0			-5	
Flared Approach: Exists?/Storage				/		/
RT Channelized						No
Lanes				1		1
Configuration				L		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:	112	
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:	1	

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		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	18					18		18
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	-0.05	-0.05	-0.05
t(3,lt)	0.00					0.70		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	4.3					6.6		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		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	18					18		18
t(f)	2.4					3.7		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	197					312		172
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						1500		
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						172		
Potential Capacity						832		
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity						832		
Probability of Queue free St.			1.00			0.93		
Step 2: LT from Major St.			**4**			**1**		
Conflicting Flows						197		
Potential Capacity						1285		
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity						1285		
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						312		
Potential Capacity						649		
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			0.92			0.99		
Movement Capacity						642		

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		312
Potential Capacity		649
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	0.92	0.99
Movement Capacity		642
Results for Two-stage process:		
a		
y		
C t		642

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				70		58
Movement Capacity (vph)				642		832
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				642		832
Volume				70		58
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		R
v (vph)	14					70		58
C(m) (vph)	1285					642		832
v/c	0.01					0.11		0.07
95% queue length	0.03					0.37		0.22
Control Delay	7.8					11.3		9.7
LOS	A					B		A
Approach Delay							10.5	
Approach LOS							B	

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	112	
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	7.8	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/22/2005
*Analysis Time Period: 8:00am - 9:00am
*Intersection: Ithaca College
Jurisdiction: Tompkins County
Units: U. S. Metric
*Analysis Year: 2027
Project ID: Coddington Road (4024)
East/West Street: Ithaca College Entrance
North/South Street: Coddington Road
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	29	57			43	53
Peak-Hour Factor, PHF	0.64	0.64			0.64	0.64
Hourly Flow Rate, HFR	45	89			67	82
Percent Heavy Vehicles	18	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				~~10~~ 11		~~11~~ 10
Peak Hour Factor, PHF				0.64		0.64
Hourly Flow Rate, HFR				15		17
Percent Heavy Vehicles				18		18
Percent Grade (%)		0			-5	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	45					15		17
C(m) (vph)	1340					648		904
v/c	0.03					0.02		0.02
95% queue length	0.10					0.07		0.06
Control Delay	7.8					10.7		9.1
LOS	A					B		A
Approach Delay							9.8	
Approach LOS							A	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/22/2005
Analysis Time Period: 8:00am - 9:00am
Intersection: Ithaca College
Jurisdiction: Tompkins County
Units: U. S. Metric
Analysis Year: 2027
Project ID: Coddington Road (4024)
East/West Street: Ithaca College Entrance
North/South Street: Coddington Road
Intersection Orientation: NS 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	57			43	53
Peak-Hour Factor, PHF	0.64	0.64			0.64	0.64
Peak-15 Minute Volume	11	22			17	21
Hourly Flow Rate, HFR	45	89			67	82
Percent Heavy Vehicles	18	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				10		11
Peak Hour Factor, PHF				0.64		0.64
Peak-15 Minute Volume				4		4
Hourly Flow Rate, HFR				15		17
Percent Heavy Vehicles				18		18
Percent Grade (%)		0			-5	
Flared Approach: Exists?/Storage				/		/
RT Channelized						No
Lanes				1		1
Configuration				L		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:	89	
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:	1	

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		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	18					18		18
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	-0.05	-0.05	-0.05
t(3,lt)	0.00					0.70		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	4.3					6.6		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		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	18					18		18
t(f)	2.4					3.7		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	149					287		108
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					1500			
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		108
Potential Capacity		904
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		904
Probability of Queue free St.	1.00	0.98

Step 2: LT from Major St.	4	1
Conflicting Flows		149
Potential Capacity		1340
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1340
Probability of Queue free St.	1.00	0.97
Maj L-Shared Prob Q free St.		0.96

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	0.96	0.96
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		287
Potential Capacity		671
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.96	
Maj. L, Min T Adj. Imp Factor.	0.97	
Cap. Adj. factor due to Impeding mvmnt	0.95	0.97
Movement Capacity		648

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	0.96	0.96
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		287
Potential Capacity		671
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.96	
Maj. L, Min T Adj. Imp Factor.	0.97	
Cap. Adj. factor due to Impeding mvmnt	0.95	0.97
Movement Capacity		648
Results for Two-stage process:		
a		
y		
C t		648

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				15		17
Movement Capacity (vph)				648		904
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				648		904
Volume				15		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		R
v (vph)	45					15		17
C(m) (vph)	1340					648		904
v/c	0.03					0.02		0.02
95% queue length	0.10					0.07		0.06
Control Delay	7.8					10.7		9.1
LOS	A					B		A
Approach Delay							9.8	
Approach LOS							A	

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	89	
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)	0.96	
d(M,LT), Delay for stream 1 or 4	7.8	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.3	

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/23/2005
*Analysis Time Period: 4:30pm - 5:30pm
*Intersection: Ithaca College
Jurisdiction: Tompkins County
Units: U. S. Metric
*Analysis Year: 2027
Project ID: Coddington Road (4024)
East/West Street: Ithaca College Entrance
North/South Street: Coddington Road
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	13	101			133	44
Peak-Hour Factor, PHF	0.81	0.81			0.81	0.81
Hourly Flow Rate, HFR	16	124			164	54
Percent Heavy Vehicles	18	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				63		52
Peak Hour Factor, PHF				0.81		0.81
Hourly Flow Rate, HFR				77		64
Percent Heavy Vehicles				18		18
Percent Grade (%)		0			-5	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	16					77		64
C(m) (vph)	1262					611		812
v/c	0.01					0.13		0.08
95% queue length	0.04					0.43		0.26
Control Delay	7.9					11.7		9.8
LOS	A					B		A
Approach Delay							10.9	
Approach LOS							B	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: S.P.W.
Agency/Co.: Dewberry-Goodkind, Inc.
Date Performed: 8/23/2005
Analysis Time Period: 4:30pm - 5:30pm
Intersection: Ithaca College
Jurisdiction: Tompkins County
Units: U. S. Metric
Analysis Year: 2027
Project ID: Coddington Road (4024)
East/West Street: Ithaca College Entrance
North/South Street: Coddington Road
Intersection Orientation: NS 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	13	101			133	44
Peak-Hour Factor, PHF	0.81	0.81			0.81	0.81
Peak-15 Minute Volume	4	31			41	14
Hourly Flow Rate, HFR	16	124			164	54
Percent Heavy Vehicles	18	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				63		52
Peak Hour Factor, PHF				0.81		0.81
Peak-15 Minute Volume				19		16
Hourly Flow Rate, HFR				77		64
Percent Heavy Vehicles				18		18
Percent Grade (%)		0			-5	
Flared Approach: Exists?/Storage				/		/
RT Channelized						No
Lanes				1		1
Configuration				L		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:	124	
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:	1	

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		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	18					18		18
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	-0.05	-0.05	-0.05
t(3,lt)	0.00					0.70		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	4.3					6.6		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		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	18					18		18
t(f)	2.4					3.7		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	218					347		191
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					1500			
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						191		
Potential Capacity						812		
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity						812		
Probability of Queue free St.			1.00			0.92		
Step 2: LT from Major St.			**4**			**1**		
Conflicting Flows						218		
Potential Capacity						1262		
Pedestrian Impedance Factor			1.00			1.00		
Movement Capacity						1262		
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						347		
Potential Capacity						619		
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			0.91			0.99		
Movement Capacity						611		

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		347	
Potential Capacity		619	
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	0.91	0.99	
Movement Capacity		611	
Results for Two-stage process:			
a			
y			
C t		611	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				77		64
Movement Capacity (vph)				611		812
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				611		812
Volume				77		64
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		R
v (vph)	16					77		64
C(m) (vph)	1262					611		812
v/c	0.01					0.13		0.08
95% queue length	0.04					0.43		0.26
Control Delay	7.9					11.7		9.8
LOS	A					B		A
Approach Delay							10.9	
Approach LOS							B	

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	124	
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	7.9	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	