OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet		0.0			0.0			0.0			0.0	
Arriv. Type		3			3			3			3	
Unit Ext.		3.0			3.0			3.0			3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time		2.0			2.0			2.0			2.0	
Ext of g		2.0			2.0			2.0			2.0	
Ped Min g		3.0			3.0			3.0			3.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	17.0					45.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

Board of Zoning Adjustment
District of Columbia
CASE NO.16559
EXHIBIT NO.443A2

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	38	0.90	42	0					
Thru	50	0.90	56	1	LTR		101	0.42	0.03
Right	3	0.90	3	0		0			
Westbound									
Left	102	0.90	113	0					
Thru	17	0.90	19	1	LTR		151	0.75	0.13
Right	17	0.90	19	0		0			
Northbound									
Left	0	0.90	0	0					
Thru	749	0.90	832	1	LTR		891	0.00	0.07
Right	53	0.90	59	0		0			
Southbound									
Left	31	0.90	34	0					
Thru	836	0.90	929	1	LTR		977	0.03	0.01
Right	13	0.90	14	0		0			

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.896	0.849	1445

Westbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.883	0.751	1260

Northbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.891	1.000	1693

Southbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.898	0.956	1632

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left							
Thru	LTR	101	1445	0.07	0.243	351	0.29
Right							
Westbound							
Pri.							
Sec.							
Left							
Thru	LTR	151	1260	# 0.12	0.243	306	0.49
Right							
Northbound							
Pri.							
Sec.							
Left							
Thru	LTR	891	1693	0.53	0.643	1088	0.82
Right							
Southbound							
Pri.							
Sec.							
Left							
Thru	LTR	977	1632	# 0.60	0.643	1049	0.93
Right							

Sum (v/s) critical = 0.72

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 0.81

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.29	0.243	21.6	1.000	351	0.50	2.1	0.0	23.6	C	23.6	C
Westbound												
LTR	0.49	0.243	22.8	1.000	306	0.50	5.6	0.0	28.4	C	28.4	C
Northbound												
LTR	0.82	0.643	9.4	1.000	1088	0.50	6.9	0.0	16.3	B	16.3	B
Southbound												
LTR	0.93	0.643	11.1	1.000	1049	0.50	15.5	0.0	26.6	C	26.6	C

Intersection Delay = 22.3 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)}]				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N** flt				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G	17.0	17.0	45.0	45.0
Effective Green Time for Lane Group, g	17.0	17.0	45.0	45.0
Opposing Effective Green Time, go	17.0	17.0	45.0	45.0
Number of Lanes in Lane Group, N	1	1	1	1
Number of Opposing Lanes, No	1	1	1	1
Adjusted Left-Turn Flow Rate, Vlt	42	113	0	34
Proportion of Left Turns in Lane Group, Plt	0.42	0.75	0.00	0.03
Proportion of Left Turns in Opposing Flow, Plto	0.75	0.42	0.03	0.00
Adjusted Opposing Flow Rate, Vo	151	101	977	891
Lost Time for Lane Group, tl	4.00	4.00	4.00	4.00
Left Turns per Cycle: LTC=VltC/3600	0.82	2.20	0.00	0.66
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo	2.94	1.96	19.00	17.33
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)	1.00	1.00	1.00	1.00
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g	4.0	0.1	0.0	19.2
Opposing Queue Ratio: qro=1-Rpo(go/C)	0.76	0.76	0.36	0.36
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g	4.36	2.15	11.63	10.57
gu =g-gq if gq>=gf, =g-gf if gq<gf	12.64	14.85	33.37	25.81
n=(gq-gf)/2, n>=0	0.19	1.00	5.81	0.00
Ptho=1-Plto	0.25	0.58	0.97	1.00
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)))	0.42	0.75	0.00	0.03
El1 (Figure 9-7)	1.61	1.53	3.65	3.36
El2=(1-Ptho**n)/Plto, El2>=1.0	1.00	1.00	5.35	1.00
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g	0.17	0.21	0.04	0.05
gdiff=max(gq-gf,0)	0.39	2.01	11.63	0.00
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)	0.85	0.75	1.00	0.96
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary	0.849	0.751	1.000	0.956

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm. For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq				
(From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
XPerm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 22.3 sec/veh Intersection LOS C

ERROR MESSAGES

No errors to report.

HCS: Signalized Intersections Release 3.1c

Inter: Foxhall Rd. and Garfield St. City/St: Washington, D.C.
Analyst: Chad A. Baird Proj #: 1636-002
Date: 05/17/00 Period: PM (2:00 - 3:00) - Existing
E/W St: Garfield Street N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Volume	28	26	5	56	27	22	3	433	38	15	426	17
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	P				NB Left	P		
Thru	P				Thru	P		
Right	P				Right	P		
Peds					Peds			
WB Left	P				SB Left	P		
Thru	P				Thru	P		
Right	P				Right	P		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	17.0					45.0		
Yellow	4.0					4.0		
All Red	0.0					0.0		

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	350	1442	0.19	0.243	22.2	C	22.2	C
Westbound								
LTR	333	1370	0.35	0.243	24.8	C	24.8	C
Northbound								
LTR	1084	1687	0.49	0.643	8.0	A	8.0	A
Southbound								
LTR	1072	1668	0.47	0.643	7.9	A	7.9	A

Intersection Delay = 10.4 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

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OPERATIONAL ANALYSIS

Intersection:	Foxhall Rd. and Garfield St.
City/State:	Washington, D.C.
Analyst:	Chad A. Baird
Project No:	1636-002
Time Period Analyzed:	PM (2:00 - 3:00) - Existing
Date:	05/17/00
East/West Street Name:	Garfield Street
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	28	26	5	56	27	22	3	433	38	15	426	17
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	8	7	2	16	8	6	1	120	11	4	118	5
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900			1900			1900	
ParkExist												
NumPark												
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0
Adj Flow		66			116			526			509	
%InSharedLn												
Prop Turns	0.47		0.09	0.53		0.21	0.01		0.08	0.03		0.04
NumPeds			0			0			0			0
NumBus		0			0			0			0	

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet		0.0			0.0			0.0			0.0	
Arriv. Type		3			3			3			3	
Unit Ext.		3.0			3.0			3.0			3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time		2.0			2.0			2.0			2.0	
Ext of g		2.0			2.0			2.0			2.0	
Ped Min g		3.0			3.0			3.0			3.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	17.0					45.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	28	0.90	31	0					
Thru	26	0.90	29	1	LTR		66	0.47	0.09
Right	5	0.90	6	0		0			
Westbound									
Left	56	0.90	62	0					
Thru	27	0.90	30	1	LTR		116	0.53	0.21
Right	22	0.90	24	0		0			
Northbound									
Left	3	0.90	3	0					
Thru	433	0.90	481	1	LTR		526	0.01	0.08
Right	38	0.90	42	0		0			
Southbound									
Left	15	0.90	17	0					
Thru	426	0.90	473	1	LTR		509	0.03	0.04
Right	17	0.90	19	0		0			

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.888	0.855	1442

Westbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.872	0.827	1370

Northbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.889	0.998	1687

Southbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.895	0.981	1668

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left							
Thru	LTR	66	1442	0.05	0.243	350	0.19
Right							
Westbound							
Pri.							
Sec.							
Left							
Thru	LTR	116	1370	# 0.08	0.243	333	0.35
Right							
Northbound							
Pri.							
Sec.							
Left							
Thru	LTR	526	1687	# 0.31	0.643	1084	0.49
Right							
Southbound							
Pri.							
Sec.							
Left							
Thru	LTR	509	1668	0.31	0.643	1072	0.47
Right							

Sum (v/s) critical = 0.40

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 0.45

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.19	0.243	21.0	1.000	350	0.50	1.2	0.0	22.2	C	22.2	C
Westbound												
LTR	0.35	0.243	21.9	1.000	333	0.50	2.9	0.0	24.8	C	24.8	C
Northbound												
LTR	0.49	0.643	6.5	1.000	1084	0.50	1.6	0.0	8.0	A	8.0	A
Southbound												
LTR	0.47	0.643	6.4	1.000	1072	0.50	1.5	0.0	7.9	A	7.9	A

Intersection Delay = 10.4 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)}]				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N** flt				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G	17.0	17.0	45.0	45.0
Effective Green Time for Lane Group, g	17.0	17.0	45.0	45.0
Opposing Effective Green Time, go	17.0	17.0	45.0	45.0
Number of Lanes in Lane Group, N	1	1	1	1
Number of Opposing Lanes, No	1	1	1	1
Adjusted Left-Turn Flow Rate, Vlt	31	62	3	17
Proportion of Left Turns in Lane Group, Plt	0.47	0.53	0.01	0.03
Proportion of Left Turns in Opposing Flow, Plto	0.53	0.47	0.03	0.01
Adjusted Opposing Flow Rate, Vo	116	66	509	526
Lost Time for Lane Group, tl	4.00	4.00	4.00	4.00
Left Turns per Cycle: LTC=VltC/3600	0.60	1.21	0.06	0.33
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo	2.26	1.28	9.90	10.23
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)	1.00	1.00	1.00	1.00
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g	5.1	2.5	35.0	25.3
Opposing Queue Ratio: qro=1-Rpo(go/C)	0.76	0.76	0.36	0.36
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g	2.84	0.45	5.51	5.75
gu =g-gq if gq>=gf, =g-gf if gq<gf	11.90	14.54	10.03	19.69
n=(gq-gf)/2, n>=0	0.00	0.00	0.00	0.00
Ptho=1-Plto	0.47	0.53	0.97	0.99
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)))	0.47	0.53	0.01	0.03
El1 (Figure 9-7)	1.56	1.48	2.32	2.36
El2=(1-Ptho**n)/Plto, El2>=1.0	1.00	1.00	1.00	1.00
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g	0.17	0.18	0.04	0.05
gdiff=max(gq-gf,0)	0.00	0.00	0.00	0.00
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)	0.86	0.83	1.00	0.98
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary	0.855	0.827	0.998	0.981

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq				
(From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
XPerm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 10.4 sec/veh Intersection LOS B

ERROR MESSAGES

No errors to report.

TOTAL FUTURE HIGHWAY CAPACITY ANALYSIS

GOROVE/SLADE ASSOCIATES
STANDARD QUEUING ANALYSIS
WEBSTER'S RED TIME QUEUE FORMULA

PROJECT: The Field School
G/SA Job#: 1636-002 BG2
DATE: June 2, 2000

COMMENTS: The Field School Entrance & Foxhall Road
Total Future
AM Peak Hour

QUEUE LENGTH IS APPROXIMATED USING THE FOLLOWING FORMULA:

Q = [2 * (VPH) * 25 * (1+T) * (1-g/C)] / [(# LANES) * (CYCLES PER HOUR)], where:

Q = QUEUE LENGTH (FEET)
VPH = PEAK HOUR TRAFFIC VOLUME
T = % OF TRUCKS / 100
g = EFFECTIVE GREEN TIME FOR MOVEMENT (SECONDS)
C = TOTAL CYCLE LENGTH (SECONDS)
CYCLES PER HOUR = 3600 / CYCLE LENGTH (SECONDS)

CYCLE LENGTH (sec) =	70	
TRUCK PERCENTAGE =	0	(default = 2)
AVG VEH. LENGTH (feet) =	25	(default = 25)
PROB. FACTOR =	2	(default = 2)

Maximum Queue In Terms of Vehicles

Direction	Vehicles
Westbound - L	1
Westbound - R	1
Northbound	13
Southbound - L	1
Southbound - T	10

MOVEMENT		VPH	g/C	LANES	QUEUE LENGTH (ft)	LINEAR QUEUE (ft)
Westbound	L	41	0.143	1	34	34
Westbound	R	27	0.300	1	18	18
Northbound	TR	754	0.571	1	314	314
Southbound	L	74	0.714	1	21	21
Southbound	T	863	0.714	1	240	240

GOROVE/SLADE ASSOCIATES
STANDARD QUEUING ANALYSIS
WEBSTER'S RED TIME QUEUE FORMULA

PROJECT: The Field School
G/SA Job#: 1636-002 BG2
DATE: June 2, 2000

COMMENTS: The Field School Entrance & Foxhall Road
Total Future
PM Peak Hour

QUEUE LENGTH IS APPROXIMATED USING THE FOLLOWING FORMULA:

Q = [2 * (VPH) * 25 * (1+T) * (1-g/C)] / [(# LANES) * (CYCLES PER HOUR)], where:

Q = QUEUE LENGTH (FEET)
VPH = PEAK HOUR TRAFFIC VOLUME
T = % OF TRUCKS / 100
g = EFFECTIVE GREEN TIME FOR MOVEMENT (SECONDS)
C = TOTAL CYCLE LENGTH (SECONDS)
CYCLES PER HOUR = 3600 / CYCLE LENGTH (SECONDS)

CYCLE LENGTH (sec) =	70	
TRUCK PERCENTAGE =	0	(default = 2)
AVG VEH. LENGTH (feet) =	25	(default = 25)
PROB. FACTOR =	2	(default = 2)

Maximum Queue In Terms of Vehicles

Direction	Vehicles
Westbound - L	1
Westbound - R	1
Northbound	9
Southbound - L	0
Southbound - T	7

MOVEMENT		VPH	g/C	LANES	QUEUE LENGTH (ft)	LINEAR QUEUE (ft)
Westbound	L	43	0.214	1	33	33
Westbound	R	29	0.371	1	18	18
Northbound	TR	467	0.500	1	227	227
Southbound	L	11	0.643	1	4	4
Southbound	T	516	0.643	1	179	179

HCS: Signalized Intersections Release 3.1c

Inter: Foxhall Rd. and Garfield St. City/St: Washington, D.C.
Analyst: Chad A. Baird Proj #: 1636-002
Date: 06/02/00 Period: AM (7:45 - 8:45) - Future
E/W St: Garfield Street N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Volume	38	50	3	107	17	17	0	763	67	31	905	13
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	16.0					46.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	333	1457	0.30	0.229	24.7	C	24.7	C
Westbound								
LTR	285	1248	0.55	0.229	31.3	C	31.3	C
Northbound								
LTR	1110	1689	0.83	0.657	16.3	B	16.3	B
Southbound								
LTR	1074	1635	0.98	0.657	34.9	C	34.9	C

Intersection Delay = 26.5 (sec/veh) Intersection LOS = C

HCS: Signalized Intersections Release 3.1c

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OPERATIONAL ANALYSIS

Intersection:	Foxhall Rd. and Garfield St.
City/State:	Washington, D.C.
Analyst:	Chad A. Baird
Project No:	1636-002
Time Period Analyzed:	AM (7:45 - 8:45) - Future
Date:	06/02/00
East/West Street Name:	Garfield Street
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	38	50	3	107	17	17	0	763	67	31	905	13
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	11	14	1	30	5	5	0	212	19	9	251	4
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900			1900			1900	
ParkExist												
NumPark												
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0
Adj Flow		101			157			922			1054	
%InSharedLn												
Prop Turns	0.42		0.03	0.76		0.12	0.00		0.08	0.03		0.01
NumPeds			0			0			0			0
NumBus		0			0			0			0	

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet		0.0			0.0			0.0			0.0	
Arriv. Type		3			3			3			3	
Unit Ext.		3.0			3.0			3.0			3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time		2.0			2.0			2.0			2.0	
Ext of g		2.0			2.0			2.0			2.0	
Ped Min g		3.0			3.0			3.0			3.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	16.0					46.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	38	0.90	42	0					
Thru	50	0.90	56	1	LTR		101	0.42	0.03
Right	3	0.90	3	0		0			
Westbound									
Left	107	0.90	119	0					
Thru	17	0.90	19	1	LTR		157	0.76	0.12
Right	17	0.90	19	0		0			
Northbound									
Left	0	0.90	0	0					
Thru	763	0.90	848	1	LTR		922	0.00	0.08
Right	67	0.90	74	0		0			
Southbound									
Left	31	0.90	34	0					
Thru	905	0.90	1006	1	LTR		1054	0.03	0.01
Right	13	0.90	14	0		0			

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound									Sec LT Adj/LT Sat:		

LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.896	0.856	1457

Westbound									Sec LT Adj/LT Sat:		

LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.884	0.744	1248

Northbound									Sec LT Adj/LT Sat:		

LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.889	1.000	1689

Southbound									Sec LT Adj/LT Sat:		

LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.898	0.958	1635

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)		Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound								
Pri.								
Sec.								
Left								
Thru	LTR	101	1457		0.07	0.229	333	0.30
Right								
Westbound								
Pri.								
Sec.								
Left								
Thru	LTR	157	1248	#	0.13	0.229	285	0.55
Right								
Northbound								
Pri.								
Sec.								
Left								
Thru	LTR	922	1689		0.55	0.657	1110	0.83
Right								
Southbound								
Pri.								
Sec.								
Left								
Thru	LTR	1054	1635	#	0.64	0.657	1074	0.98
Right								

Sum (v/s) critical = 0.77

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 0.87

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.30	0.229	22.4	1.000	333	0.50	2.3	0.0	24.7	C	24.7	C
Westbound												
LTR	0.55	0.229	23.8	1.000	285	0.50	7.5	0.0	31.3	C	31.3	C
Northbound												
LTR	0.83	0.657	9.1	1.000	1110	0.50	7.3	0.0	16.3	B	16.3	B
Southbound												
LTR	0.98	0.657	11.6	1.000	1074	0.50	23.3	0.0	34.9	C	34.9	C

Intersection Delay = 26.5 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)}]				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}]				
*[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G	16.0	16.0	46.0	46.0
Effective Green Time for Lane Group, g	16.0	16.0	46.0	46.0
Opposing Effective Green Time, go	16.0	16.0	46.0	46.0
Number of Lanes in Lane Group, N	1	1	1	1
Number of Opposing Lanes, No	1	1	1	1
Adjusted Left-Turn Flow Rate, Vlt	42	119	0	34
Proportion of Left Turns in Lane Group, Plt	0.42	0.76	0.00	0.03
Proportion of Left Turns in Opposing Flow, Plto	0.76	0.42	0.03	0.00
Adjusted Opposing Flow Rate, Vo	157	101	1054	922
Lost Time for Lane Group, tl	4.00	4.00	4.00	4.00
Left Turns per Cycle: LTC=VltC/3600	0.82	2.31	0.00	0.66
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo	3.05	1.96	20.49	17.93
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)	1.00	1.00	1.00	1.00
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g	3.5	0.0	0.0	19.7
Opposing Queue Ratio: qro=1-Rpo(go/C)	0.77	0.77	0.34	0.34
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g	4.79	2.28	11.86	10.32
gu =g-gq if gq>=gf, =g-gf if gq<gf	11.21	13.72	34.14	26.29
n= (gq-gf)/2, n>=0	0.64	1.14	5.93	0.00
Ptho=1-Plto	0.24	0.58	0.97	1.00
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)})	0.42	0.76	0.00	0.03
El1 (Figure 9-7)	1.62	1.53	3.93	3.46
El2=(1-Ptho**n)/Plto, El2>=1.0	1.00	1.10	5.48	1.00
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g	0.18	0.22	0.04	0.04
gdiff=max(gq-gf,0)	1.28	2.28	11.86	0.00
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)	0.86	0.74	1.00	0.96
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}]				
+[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary	0.856	0.744	1.000	0.958

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq				
(From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
XPerm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 26.5 sec/veh Intersection LOS C

ERROR MESSAGES

No errors to report.

HCS: Signalized Intersections Release 3.1c

Inter: Foxhall Rd. and Garfield St. City/St: Washington, D.C.
Analyst: Chad A. Baird Proj #: 1636-002
Date: 06/02/00 Period: PM (2:00 - 3:00) - Future
E/W St: Garfield Street N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Volume	28	26	5	57	27	22	3	465	52	15	446	17
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P				NB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
WB Left	P				SB Left	P			
Thru	P				Thru	P			
Right	P				Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	16.0					46.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	328	1436	0.20	0.229	23.2	C	23.2	C
Westbound								
LTR	311	1362	0.38	0.229	26.2	C	26.2	C
Northbound								
LTR	1105	1682	0.52	0.657	8.0	A	8.0	A
Southbound								
LTR	1095	1667	0.49	0.657	7.6	A	7.6	A

Intersection Delay = 10.3 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

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OPERATIONAL ANALYSIS

Intersection:	Foxhall Rd. and Garfield St.
City/State:	Washington, D.C.
Analyst:	Chad A. Baird
Project No:	1636-002
Time Period Analyzed:	PM (2:00 - 3:00) - Future
Date:	06/02/00
East/West Street Name:	Garfield Street
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	28	26	5	57	27	22	3	465	52	15	446	17
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
MK 15 Vol	8	7	2	16	8	6	1	129	14	4	124	5
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900			1900			1900	
ParkExist												
NumPark												
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
LGConfig		LTR			LTR			LTR			LTR	
Lane Width		12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0
Adj Flow		66			117			578			532	
%InSharedLn												
Prop Turns	0.47		0.09	0.54		0.21	0.01		0.10	0.03		0.04
NumPeds			0			0			0			0
NumBus		0			0			0			0	

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet		0.0			0.0			0.0			0.0	
Arriv. Type		3			3			3			3	
Unit Ext.		3.0			3.0			3.0			3.0	
I Factor		1.000			1.000			1.000			1.000	
Inst Time		2.0			2.0			2.0			2.0	
Ext of g		2.0			2.0			2.0			2.0	
Ped Min g		3.0			3.0			3.0			3.0	

PHASE DATA

Phase Combination	1	2	3	4	5	6	7	8
EB Left	P				NB Left	P		
Thru	P				Thru	P		
Right	P				Right	P		
Peds					Peds			
WB Left	P				SB Left	P		
Thru	P				Thru	P		
Right	P				Right	P		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	16.0					46.0		
Yellow	4.0					4.0		
All Red	0.0					0.0		

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	28	0.90	31	0					
Thru	26	0.90	29	1	LTR		66	0.47	0.09
Right	5	0.90	6	0		0			
Westbound									
Left	57	0.90	63	0					
Thru	27	0.90	30	1	LTR		117	0.54	0.21
Right	22	0.90	24	0		0			
Northbound									
Left	3	0.90	3	0					
Thru	465	0.90	517	1	LTR		578	0.01	0.10
Right	52	0.90	58	0		0			
Southbound									
Left	15	0.90	17	0					
Thru	446	0.90	496	1	LTR		532	0.03	0.04
Right	17	0.90	19	0		0			

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.888	0.852	1436

Westbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.872	0.822	1362

Northbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.886	0.998	1682

Southbound							Sec LT Adj/LT Sat:		----		
LTR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.895	0.980	1667

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left							
Thru	LTR	66	1436	0.05	0.229	328	0.20
Right							
Westbound							
Pri.							
Sec.							
Left							
Thru	LTR	117	1362	# 0.09	0.229	311	0.38
Right							
Northbound							
Pri.							
Sec.							
Left							
Thru	LTR	578	1682	# 0.34	0.657	1105	0.52
Right							
Southbound							
Pri.							
Sec.							
Left							
Thru	LTR	532	1667	0.32	0.657	1095	0.49
Right							

Sum (v/s) critical = 0.43

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 0.48

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.20	0.229	21.8	1.000	328	0.50	1.4	0.0	23.2	C	23.2	C
Westbound												
LTR	0.38	0.229	22.8	1.000	311	0.50	3.4	0.0	26.2	C	26.2	C
Northbound												
LTR	0.52	0.657	6.3	1.000	1105	0.50	1.8	0.0	8.0	A	8.0	A
Southbound												
LTR	0.49	0.657	6.0	1.000	1095	0.50	1.5	0.0	7.6	A	7.6	A

Intersection Delay = 10.3 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)}]				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N** flt				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G	16.0	16.0	46.0	46.0
Effective Green Time for Lane Group, g	16.0	16.0	46.0	46.0
Opposing Effective Green Time, go	16.0	16.0	46.0	46.0
Number of Lanes in Lane Group, N	1	1	1	1
Number of Opposing Lanes, No	1	1	1	1
Adjusted Left-Turn Flow Rate, Vlt	31	63	3	17
Proportion of Left Turns in Lane Group, Plt	0.47	0.54	0.01	0.03
Proportion of Left Turns in Opposing Flow, Plto	0.54	0.47	0.03	0.01
Adjusted Opposing Flow Rate, Vo	117	66	532	578
Lost Time for Lane Group, tl	4.00	4.00	4.00	4.00
Left Turns per Cycle: LTC=VltC/3600	0.60	1.23	0.06	0.33
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo	2.28	1.28	10.34	11.24
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)	1.00	1.00	1.00	1.00
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g	4.6	2.0	35.8	26.0
Opposing Queue Ratio: qro=1-Rpo(go/C)	0.77	0.77	0.34	0.34
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g	3.02	0.54	5.42	6.03
gu =g-gq if gq>=gf, =g-gf if gq<gf	11.44	13.98	10.17	20.04
n=(gq-gf)/2, n>=0	0.00	0.00	0.00	0.00
Ptho=1-Plto	0.46	0.53	0.97	0.99
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)})	0.47	0.54	0.01	0.03
El1 (Figure 9-7)	1.56	1.48	2.37	2.48
El2=(1-Ptho**n)/Plto, El2>=1.0	1.00	1.00	1.00	1.00
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g	0.18	0.19	0.04	0.04
gdiff=max(gq-gf,0)	0.00	0.00	0.00	0.00
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)	0.85	0.82	1.00	0.98
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary	0.852	0.822	0.998	0.980

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq				
(From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
XPerm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 10.3 sec/veh Intersection LOS B

ERROR MESSAGES

No errors to report.

HCS: Signalized Intersections Release 3.1c

Inter: Field School and Foxhall Road City/St: Washington, D.C.
Analyst: Chad A Baird Proj #: 1634-006
Date: 06/02/00 Period: AM - Total Future
E/W St: The Field School Driveway N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	0	1	0	1	1	0
LGConfig				L		R		TR		L	T	
Volume				41		27		722	32	74	863	
Lane Width				12.0		12.0		12.0		12.0	12.0	
RTOR Vol						0			0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left				
Thru					Thru		A		
Right					Right		A		
Peds					Peds				
WB Left	A				SB Left	A	A		
Thru					Thru	A	A		
Right	A				Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right	A			
Green	10.0					6.0	40.0		
Yellow	4.0					4.0	4.0		
All Red	1.0					0.0	1.0		

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
	258	1805	0.18	0.143	26.7	C		
							23.1	C
R	485	1615	0.06	0.300	17.5	B		
Northbound								
TR	971	1699	0.86	0.571	20.8	C	20.8	C
Southbound								
L	413		0.20	0.714	5.5	A		
	1357	1900	0.71	0.714	7.5	A	7.3	A

Intersection Delay = 13.7 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

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OPERATIONAL ANALYSIS

Intersection:	Field School and Foxhall Road
City/State:	Washington, D.C.
Analyst:	Chad A Baird
Project No:	1634-006
Time Period Analyzed:	AM - Total Future
Date:	06/02/00
East/West Street Name:	The Field School Driveway
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume				41		27		722	32	74	863	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
[illegible]K 15 Vol				11		8		201	9	21	240	
Hi Ln Vol												
% Grade					0			0			0	
[illegible]deal Sat				1900		1900		1900		1900	1900	
[illegible]arkExist												
NumPark												
[illegible] Heavy Veh				0		0		0	0	0	0	
[illegible]o. Lanes	0	0	0	1	0	1	0	1	0	1	1	0
LGConfig				L		R		TR		L	T	
[illegible]ane Width				12.0		12.0		12.0		12.0	12.0	
[illegible]TOR Vol						0			0			
Adj Flow				46		30		838		82	959	
[illegible]nSharedLn												
[illegible]top Turns									0.04			
NumPeds			0			0			0			
[illegible]umBus				0		0		0		0	0	

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet				0.0		0.0		0.0		0.0	0.0	
Actriv. Type				3		3		3		3	3	
Unit Ext.				3.0		3.0		3.0		3.0	3.0	
I Factor					1.000			1.000			1.000	
Lost Time				2.0		2.0		2.0		2.0	2.0	
Ext of g				2.0		2.0		2.0		2.0	2.0	
Ped Min g					3.0			3.0			3.0	

PHASE DATA

Phase Combination	1	2	3	4	5	6	7	8
EB Left					NB Left			
Thru					Thru	A		
Right					Right	A		
Peds					Peds			
WB Left	A				SB Left	A	A	
Thru					Thru	A	A	
Right	A				Right			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right	A		
Green	10.0					6.0	40.0	
Yellow	4.0					4.0	4.0	
All Red	1.0					0.0	1.0	

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left				0					
Thru				0					
Right				0					
Westbound									
Left	41	0.90	46	1	L		46		
Thru				0					
Right	27	0.90	30	1	R	0	30		
Northbound									
Left				0					
Thru	722	0.90	802	1	TR		838		0.04
Right	32	0.90	36	0		0			
Southbound									
Left	74	0.90	82	1	L		82		
Thru	863	0.90	959	1	T		959		
Right				0					

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:		----		
					---					----	
Westbound							Sec LT Adj/LT Sat:				
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.950	1805

R	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.850	----	1615
Northbound							Sec LT Adj/LT Sat:		----		
TR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.894	1.000	1699

Southbound							Sec LT Adj/LT Sat:			0.216	411
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.950	1805
T	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	1.000	1.000	1900

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left							
Thru							
Right							
Westbound							
Pri.							
Sec.							
Left	L	46	1805	# 0.03	0.143	258	0.18
Thru							
Right	R	30	1615	0.02	0.300	485	0.06
Northbound							
Pri.							
Sec.							
Left							
Thru	TR	838	1699	# 0.49	0.571	971	0.86
Right							
Southbound							
Pri.		82	1805	# 0.05	0.086	155	0.53
Sec.		0	411	0.00	0.629	258	0.00
Left	L	82			0.714	413	0.20
Thru	T	959	1900	0.50	0.714	1357	0.71
Right							

Sum (v/s) critical = 0.56

Lost Time/Cycle, L = 15.00 sec Critical v/c(X) = 0.72

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
Westbound												
L	0.18	0.143	26.4	1.000	258	0.11	0.3	0.0	26.7	C		
											23.1	C
R	0.06	0.300	17.5	1.000	485	0.11	0.1	0.0	17.5	B		
Northbound												
TR	0.86	0.571	12.7	1.000	971	0.39	8.1	0.0	20.8	C	20.8	C
Southbound												
L	0.20	0.714	5.3	1.000	413	0.11	0.2	0.0	5.5	A		
T	0.71	0.714	5.8	1.000	1357	0.27	1.7	0.0	7.5	A	7.3	A

Intersection Delay = 13.7 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				50.0
Effective Green Time for Lane Group, g				44.0
Opposing Effective Green Time, go				40.0
Number of Lanes in Lane Group, N				1
Number of Opposing Lanes, No				1
Adjusted Left-Turn Flow Rate, Vlt				82
Proportion of Left Turns in Opposing Flow, Plto				0.00
Adjusted Opposing Flow Rate, Vo				838
Lost Time for Lane Group, tl				5.00
Left Turns per Cycle: LTC=VltC/3600				1.59
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				16.29
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				1.00
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				0.0
Opposing Queue Ratio: qro=1-Rpo(go/C)				0.43
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				16.87
gu =g-gq if gq>=gf, =g-gf if gq<gf				27.13
n=(gq-gf)/2, n>=0				8.44
Ptho=1-Plto				1.00
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)}]				1.00
El1 (Figure 9-7)				2.85
El2=(1-Ptho**n)/Plto, El2>=1.0				1.00
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				0.09
gdiff=max(gq-gf,0)				0.00
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				0.22
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] [gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt				0.216

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Lane Group, Plt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
El1*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)})				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}]				
+[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v		-		82
v/c ratio from Capacity Worksheet, X				0.20
Primary phase effective green, g				6.0
Secondary phase effective green, gq				16.87
(From Supplemental Permitted LT Worksheet), gu				27.13
Cycle length, C 70.0 Red =(C-g-gq-gu), r				20.0
Arrivals: v/(3600(max(X,1.0))), qa				0.02
Primary ph. departures: s/3600, sp				0.501
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				0.19
Xterm				0.20
XProt				0.20
XCase				1
Queue at beginning of green arrow, Qa				0.46
Queue at beginning of unsaturated green, Qu				0.38
Residual queue, Qr				0.00
Uniform Delay, d1				5.3

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 13.7 sec/veh Intersection LOS B

ERROR MESSAGES

No errors to report.

HCS: Signalized Intersections Release 3.1c

Inter: Field School and Foxhall Road City/St: Washington, D.C.
Analyst: Chad A Baird Proj #: 1634-006
Date: 06/02/00 Period: PM - Total Future
E/W St: The Field School Driveway N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	0	1	0	1	1	0
LGConfig				L		R		TR		L	T	
Volume				43		29		464	3	11	516	
Lane Width				12.0		12.0		12.0		12.0	12.0	
RTOR Vol						0			0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left				
Thru					Thru		A		
Right					Right		A		
Peds					Peds				
WB Left	A				SB Left	A	A		
Thru					Thru	A	A		
Right	A				Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right	A			
Green	15.0					6.0	35.0		
Yellow	4.0					4.0	4.0		
All Red	1.0					0.0	1.0		

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
L	387	1805	0.12	0.214	22.3	C		
							19.1	B
R	600	1615	0.05	0.371	14.1	B		
Northbound								
TR	855	1709	0.61	0.500	13.8	B	13.8	B
Southbound								
L	478		0.03	0.643	5.9	A		
T	1221	1900	0.47	0.643	6.7	A	6.7	A

Intersection Delay = 10.6 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

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OPERATIONAL ANALYSIS

Intersection:	Field School and Foxhall Road
City/State:	Washington, D.C.
Analyst:	Chad A Baird
Project No:	1634-006
Time Period Analyzed:	PM - Total Future
Date:	06/02/00
East/West Street Name:	The Field School Driveway
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume				43		29		464	3	11	516	
[illegible]F				0.90		0.90		0.90	0.90	0.90	0.90	
[illegible] 15 Vol				12		8		129	1	3	143	
Hi Ln Vol												
[illegible]Grade					0			0			0	
[illegible]eal Sat				1900		1900		1900		1900	1900	
ParkExist												
[illegible]umPark												
[illegible] Heavy Veh				0		0		0	0	0	0	
No. Lanes	0	0	0	1	0	1	0	1	0	1	1	0
LGConfig				L		R		TR		L	T	
[illegible]ane Width				12.0		12.0		12.0		12.0	12.0	
RTOR Vol						0			0			
Adj Flow				48		32		519		12	573	
[illegible]nSharedLn												
Prop Turns									0.01			
NumPeds			0			0			0			
[illegible]umBus				0		0		0		0	0	

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet				0.0		0.0		0.0		0.0	0.0	
Arriv. Type				3		3		3		3	3	
Unit Ext.				3.0		3.0		3.0		3.0	3.0	
I Factor					1.000			1.000			1.000	
Lost Time				2.0		2.0		2.0		2.0	2.0	
Ext of g				2.0		2.0		2.0		2.0	2.0	
Ped Min g					3.0			3.0			3.0	

PHASE DATA

Phase Combination	1	2	3	4	5	6	7	8
EB Left					NB Left			
Thru					Thru	A		
Right					Right	A		
Peds					Peds			
WB Left	A				SB Left	A	A	
Thru					Thru	A	A	
Right	A				Right			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right	A		
Green	15.0					6.0	35.0	
Yellow	4.0					4.0	4.0	
All Red	1.0					0.0	1.0	

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left				0					
Thru				0					
Right				0					
Westbound									
Left	43	0.90	48	1	L		48		
Thru				0					
Right	29	0.90	32	1	R	0	32		
Northbound									
Left				0					
Thru	464	0.90	516	1	TR		519		0.01
Right	3	0.90	3	0		0			
Southbound									
Left	11	0.90	12	1	L		12		
Thru	516	0.90	573	1	T		573		
Right				0					

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:		----		
					---					----	
Westbound							Sec LT Adj/LT Sat:				
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.950	1805

R	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.850	----	1615
Northbound							Sec LT Adj/LT Sat:				

TR	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.899	1.000	1709

Southbound							Sec LT Adj/LT Sat:			0.305	579
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.950	1805
T	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	1.000	1.000	1900

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left							
Thru							
Right							
Westbound							
Pri.							
Sec.							
Left	L	48	1805	# 0.03	0.214	387	0.12
Thru							
Right	R	32	1615	0.02	0.371	600	0.05
Northbound							
Pri.							
Sec.							
Left							
Thru	TR	519	1709	# 0.30	0.500	855	0.61
Right							
Southbound							
Pri.		12	1805	# 0.01	0.086	155	0.08
Sec.		0	579	0.00	0.557	323	0.00
Left	L	12			0.643	478	0.03
Thru	T	573	1900	0.30	0.643	1221	0.47
Right							

Sum (v/s) critical = 0.34

Lost Time/Cycle, L = 15.00 sec Critical v/c(X) = 0.43

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
Westbound												
L	0.12	0.214	22.2	1.000	387	0.11	0.1	0.0	22.3	C		
											19.1	B
R	0.05	0.371	14.1	1.000	600	0.11	0.0	0.0	14.1	B		
Northbound												
TR	0.61	0.500	12.6	1.000	855	0.19	1.2	0.0	13.8	B	13.8	B
Southbound												
L	0.03	0.643	5.9	1.000	478	0.11	0.0	0.0	5.9	A		
T	0.47	0.643	6.4	1.000	1221	0.11	0.3	0.0	6.7	A	6.7	A

Intersection Delay = 10.6 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				45.0
Effective Green Time for Lane Group, g				39.0
Opposing Effective Green Time, go				35.0
Number of Lanes in Lane Group, N				1
Number of Opposing Lanes, No				1
Adjusted Left-Turn Flow Rate, Vlt				12
Proportion of Left Turns in Opposing Flow, Plto				0.00
Adjusted Opposing Flow Rate, Vo				519
Lost Time for Lane Group, tl				5.00
Left Turns per Cycle: LTC=VltC/3600				0.23
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				10.09
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				1.00
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				0.0
Opposing Queue Ratio: qro=1-Rpo(go/C)				0.50
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				13.79
gu =g-gq if gq>=gf, =g-gf if gq<gf				25.21
n=(gq-gf)/2, n>=0				6.90
Ptho=1-Plto				1.00
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)}]				1.00
El1 (Figure 9-7)				2.12
El2=(1-Ptho**n)/Plto, El2>=1.0				1.00
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				0.10
gdiff=max(gq-gf,0)				0.00
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				0.30
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N** flt				0.305

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Lane Group, Plt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
El1*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)))				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] [gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				12
v/c ratio from Capacity Worksheet, X				0.03
Primary phase effective green, g				6.0
Secondary phase effective green, gq				13.79
(From Supplemental Permitted LT Worksheet), gu				25.21
Cycle length, C 70.0 Red =(C-g-gq-gu), r				25.0
Arrivals: v/(3600(max(X,1.0))), qa				0.00
Primary ph. departures: s/3600, sp				0.501
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				0.25
XPerm				0.02
XProt				0.03
XCase				1
Queue at beginning of green arrow, Qa				0.08
Queue at beginning of unsaturated green, Qu				0.05
Residual queue, Qr				0.00
Uniform Delay, d1				5.9

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 10.6 sec/veh Intersection LOS B

ERROR MESSAGES

No errors to report.

HCS: Signalized Intersections Release 3.1c

Inter: Whithaven Pwy and Foxhall Road City/St: Washington, D.C.
Analyst: Chad A Baird Proj #: 1634-006
Date: 06/02/00 Period: AM - Total Future - Mitigation
E/W St: Whitehaven Parkway N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
LGConfig	L		R				L	T			T	R
Volume	54		79				42	688			794	179
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
RTOR Vol			0									0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru						Thru	A			
Right	A					Right				
Peds						Peds				
WB Left					SB	Left				
Thru						Thru	A			
Right						Right	A			
Peds						Peds				
NB Right					EB	Right				
SB Right	A				WB	Right				
Green	16.0						46.0			
Yellow	4.0						4.0			
All Red	0.0						0.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	413	1805	0.15	0.229	21.7	C		
							22.1	C
R	369	1615	0.24	0.229	22.4	C		
Westbound								
Northbound								
L	331	503	0.14	0.657	4.7	A		
T	1249	1900	0.61	0.657	7.8	A	7.6	A
Southbound								
T	1249	1900	0.71	0.657	9.5	A	7.8	A
R	1615	1615	0.12	1.000	0.0+	A		

Intersection Delay = 8.7 (sec/veh) Intersection LOS = A

HCS: Signalized Intersections Release 3.1c

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OPERATIONAL ANALYSIS

Intersection:	Whithaven Pwy and Foxhall Road
City/State:	Washington, D.C.
Analyst:	Chad A Baird
Project No:	1634-006
Time Period Analyzed:	AM - Total Future - Mitigation
Date:	06/02/00
East/West Street Name:	Whitehaven Parkway
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	54		79				42	688			794	179
PHF	0.90		0.90				0.90	0.90			0.90	0.90
[redacted] 15 Vol	15		22				12	191			221	50
Hi Ln Vol												
% Grade		0						0			0	
Ideal Sat	1900		1900				1900	1900			1900	1900
ParkExist												
NumPark												
% Heavy Veh	0		0				0	0			0	0
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
LGConfig	L		R				L	T			T	R
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
RTOR Vol			0									0
Adj Flow	60		88				47	764			882	199
%InSharedLn												
Prop Turns												
NumPeds			0			0						0
NumBus	0		0				0	0			0	0

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0		0.0				0.0	0.0			0.0	0.0
Arriv. Type	3		3				3	3			3	3
Unit Ext.	3.0		3.0				3.0	3.0			3.0	3.0
I Factor		1.000						1.000			1.000	
Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Ext of g	2.0		2.0				2.0	2.0			2.0	2.0
Ped Min g		3.0						3.0			3.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A				NB Left	A			
Thru					Thru	A			
Right	A				Right				
Peds					Peds				
WB Left					SB Left				
Thru					Thru	A			
Right					Right	A			
Peds					Peds				
NB Right					EB Right				
SB Right	A				WB Right				
Green	16.0					46.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	54	0.90	60	1	L		60		
Thru				0					
Right	79	0.90	88	1	R	0	88		
Westbound									
Left				0					
Thru				0					
Right				0					
Northbound									
Left	42	0.90	47	1	L		47		
Thru	688	0.90	764	1	T		764		
Right				0					
Southbound									
Left				0					
Thru	794	0.90	882	1	T		882		
Right	179	0.90	199	1	R	0	199		

[1] Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:				
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.950	1805

R	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.850	----	1615
Westbound							Sec LT Adj/LT Sat:				

Northbound							Sec LT Adj/LT Sat:				
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.265	503
T	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	1.000	1.000	1900

Southbound							Sec LT Adj/LT Sat:				

T	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	1.000	1.000	1900
R	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.850	----	1615

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left	L	60	1805	0.03	0.229	413	0.15
Thru							
Right	R	88	1615	# 0.05	0.229	369	0.24
Westbound							
Pri.							
Sec.							
Left							
Thru							
Right							
Northbound							
Pri.							
Sec.							
Left	L	47	503	0.09	0.657	331	0.14
Thru	T	764	1900	0.40	0.657	1249	0.61
Right							
Southbound							
Pri.							
Sec.							
Left							
Thru	T	882	1900	# 0.46	0.657	1249	0.71
Right	R	199	1615	0.12	1.000	1615	0.12

Sum (v/s) critical = 0.52

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 0.59

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.15	0.229	21.5	1.000	413	0.11	0.2	0.0	21.7	C		
											22.1	C
R	0.24	0.229	22.0	1.000	369	0.11	0.3	0.0	22.4	C		
Westbound												
Northbound												
L	0.14	0.657	4.5	1.000	331	0.11	0.2	0.0	4.7	A		
T	0.61	0.657	6.9	1.000	1249	0.20	0.9	0.0	7.8	A	7.6	A
Southbound												
T	0.71	0.657	7.7	1.000	1249	0.27	1.8	0.0	9.5	A	7.8	A
R	0.12	1.000	0.0	1.000	1615	0.11	0.0	0.0	0.0+	A		

Intersection Delay = 8.7 (sec/veh) Intersection LOS = A

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G			46.0	
Effective Green Time for Lane Group, g			46.0	
Opposing Effective Green Time, go			46.0	
Number of Lanes in Lane Group, N			1	
Number of Opposing Lanes, No			1	
Adjusted Left-Turn Flow Rate, Vlt			47	
Proportion of Left Turns in Opposing Flow, Plto			0.00	
Adjusted Opposing Flow Rate, Vo			882	
Lost Time for Lane Group, tl			4.00	
Left Turns per Cycle: LTC=VltC/3600			0.91	
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo			17.15	
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)			1.00	
gf=[Gexp(-a * (LTC ** b))]-tl, gf<=g			0.0	
Opposing Queue Ratio: qro=1-Rpo(go/C)			0.34	
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g			9.84	
gu =g-gq if gq>=gf, =g-gf if gq<gf			36.16	
n=(gq-gf)/2, n>=0			4.92	
Ptho=1-Plto			1.00	
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)}]			1.00	
El1 (Figure 9-7)			2.97	
El2=(1-Ptho**n)/Plto, El2>=1.0			1.00	
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g			0.09	
gdiff=max(gq-gf,0)			0.00	
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)			0.26	
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt			0.265	

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm. For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Lane Group, Plt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
El1*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)))				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}]				
+[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq				
(From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
Xperm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 8.7 sec/veh Intersection LOS A

ERROR MESSAGES

No errors to report.

HCS: Signalized Intersections Release 3.1c

Inter: Whithaven Pwy and Foxhall Road City/St: Washington, D.C.
Analyst: Chad A Baird Proj #: 1634-006
Date: 06/02/00 Period: PM - Total Future - Mitigation
E/W St: Whitehaven Parkway N/S St: Foxhall Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
LGConfig	L		R				L	T			T	R
Volume	34		40				34	535			518	99
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
RTOR Vol			0									0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A				NB Left	A			
Thru					Thru	A			
Right	A				Right				
Peds					Peds				
WB Left					SB Left				
Thru					Thru	A			
Right					Right	A			
Peds					Peds				
NB Right					EB Right				
SB Right	A				WB Right				
Green	16.0					46.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	413	1805	0.09	0.229	21.4	C		
							21.5	C
R	369	1615	0.12	0.229	21.6	C		
Westbound								
Northbound								
L	486	739	0.08	0.657	4.4	A		
T	1249	1900	0.48	0.657	6.3	A	6.2	A
Southbound								
T	1249	1900	0.46	0.657	6.2	A	5.2	A
R	1615	1615	0.07	1.000	0.0+	A		

Intersection Delay = 6.6 (sec/veh) Intersection LOS = A

HCS: Signalized Intersections Release 3.1c

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OPERATIONAL ANALYSIS

Intersection:	Whithaven Pwy and Foxhall Road
City/State:	Washington, D.C.
Analyst:	Chad A Baird
Project No:	1634-006
Time Period Analyzed:	PM - Total Future - Mitigation
Date:	06/02/00
East/West Street Name:	Whitehaven Parkway
North/South Street Name:	Foxhall Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	34		40				34	535			518	99
PHF	0.90		0.90				0.90	0.90			0.90	0.90
K 15 Vol	9		11				9	149			144	28
Hi Ln Vol												
% Grade		0						0			0	
deal Sat	1900		1900				1900	1900			1900	1900
arkExist												
NumPark												
Heavy Veh	0		0				0	0			0	0
o. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
LGConfig	L		R				L	T			T	R
ane Width	12.0		12.0				12.0	12.0			12.0	12.0
TOR Vol			0									0
Adj Flow	38		44				38	594			576	110
InSharedLn												
rop Turns												
NumPeds			0			0						0
umBus	0		0				0	0			0	0

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0		0.0				0.0	0.0			0.0	0.0
Arriv. Type	3		3				3	3			3	3
Unit Ext.	3.0		3.0				3.0	3.0			3.0	3.0
I Factor		1.000						1.000			1.000	
Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Ext of g	2.0		2.0				2.0	2.0			2.0	2.0
Ped Min g		3.0						3.0			3.0	

PHASE DATA

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A				NB Left	A			
Thru					Thru	A			
Right	A				Right				
Peds					Peds				
WB Left					SB Left				
Thru					Thru	A			
Right					Right	A			
Peds					Peds				
NB Right					EB Right				
SB Right	A				WB Right				
Green	16.0					46.0			
Yellow	4.0					4.0			
All Red	0.0					0.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT WORKSHEET

Appr./ Movement	Mvt Volume	PHF	Flow Rate	No. Lanes	Lane Group	RTOR	Adjusted Flow Rate In Lane Grp	Prop. Left Turns	Prop. Right Turns
Eastbound									
Left	34	0.90	38	1	L		38		
Thru				0					
Right	40	0.90	44	1	R	0	44		
Westbound									
Left				0					
Thru				0					
Right				0					
Northbound									
Left	34	0.90	38	1	L		38		
Thru	535	0.90	594	1	T		594		
Right				0					
Southbound									
Left				0					
Thru	518	0.90	576	1	T		576		
Right	99	0.90	110	1	R	0	110		

* Value entered by user.

SATURATION FLOW ADJUSTMENT WORKSHEET

Appr/ Lane Group	Ideal Sat Flow	f W	f HV	f G	f P	f BB	f A	f LU	f RT	f LT	Adj Sat Flow
Eastbound							Sec LT Adj/LT Sat:				
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.950	1805

R	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.850	----	1615
Westbound							Sec LT Adj/LT Sat:				

Northbound							Sec LT Adj/LT Sat:				
L	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	----	0.389	739
T	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	1.000	1.000	1900

Southbound							Sec LT Adj/LT Sat:				

T	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	1.000	1.000	1900
R	1900	1.000	1.000	1.000	1.000	1.000	1.00	1.00	0.850	----	1615

CAPACITY ANALYSIS WORKSHEET

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Pri.							
Sec.							
Left	L	38	1805	0.02	0.229	413	0.09
Thru							
Right	R	44	1615	# 0.03	0.229	369	0.12
Westbound							
Pri.							
Sec.							
Left							
Thru							
Right							
Northbound							
Pri.							
Sec.							
Left	L	38	739	0.05	0.657	486	0.08
Thru	T	594	1900	# 0.31	0.657	1249	0.48
Right							
Southbound							
Pri.							
Sec.							
Left							
Thru	T	576	1900	0.30	0.657	1249	0.46
Right	R	110	1615	0.07	1.000	1615	0.07

Sum (v/s) critical = 0.34

Lost Time/Cycle, L = 8.00 sec Critical v/c(X) = 0.38

LEVEL OF SERVICE WORKSHEET

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.09	0.229	21.3	1.000	413	0.11	0.1	0.0	21.4	C		
											21.5	C
R	0.12	0.229	21.4	1.000	369	0.11	0.1	0.0	21.6	C		
Westbound												
Northbound												
L	0.08	0.657	4.3	1.000	486	0.11	0.1	0.0	4.4	A		
T	0.48	0.657	6.0	1.000	1249	0.11	0.3	0.0	6.3	A	6.2	A
Southbound												
T	0.46	0.657	5.9	1.000	1249	0.11	0.3	0.0	6.2	A	5.2	A
R	0.07	1.000	0.0	1.000	1615	0.11	0.0	0.0	0.0+	A		

Intersection Delay = 6.6 (sec/veh) Intersection LOS = A

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G			46.0	
Effective Green Time for Lane Group, g			46.0	
Opposing Effective Green Time, go			46.0	
Number of Lanes in Lane Group, N			1	
Number of Opposing Lanes, No			1	
Adjusted Left-Turn Flow Rate, Vlt			38	
Proportion of Left Turns in Opposing Flow, Plto			0.00	
Adjusted Opposing Flow Rate, Vo			576	
Lost Time for Lane Group, tl			4.00	
Left Turns per Cycle: LTC=VltC/3600			0.74	
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo			11.20	
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)			1.00	
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g			0.0	
Opposing Queue Ratio: qro=1-Rpo(go/C)			0.34	
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g			6.01	
gu =g-gq if gq>=gf, =g-gf if gq<gf			39.99	
n=(gq-gf)/2, n>=0			3.00	
Ptho=1-Plto			1.00	
Pl*=Plt[1+{(N-1)g/(gf+gu/El1+4.24)}]			1.00	
El1 (Figure 9-7)			2.23	
El2=(1-Ptho**n)/Plto, El2>=1.0			1.00	
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g			0.09	
gdiff=max(gq-gf,0)			0.00	
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)			0.39	
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}] +[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N** flt			0.389	

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm. For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

APPROACH	EB	WB	NB	SB
Cycle Length, C 70.0 sec				
Actual Green Time for Lane Group, G				
Effective Green Time for Lane Group, g				
Opposing Effective Green Time, go				
Number of Lanes in Lane Group, N				
Number of Opposing Lanes, No				
Adjusted Left-Turn Flow Rate, Vlt				
Proportion of Left Turns in Lane Group, Plt				
Proportion of Left Turns in Opposing Flow, Plto				
Adjusted Opposing Flow Rate, Vo				
Lost Time for Lane Group, tl				
Left Turns per Cycle: LTC=VltC/3600				
Opposing Flow per Lane, Per Cycle: Volc=VoC/3600fluo				
Opposing Platoon Ratio, Rpo (Table 9-2 or Eqn 9-7)				
gf=[Gexp(- a * (LTC ** b))]-tl, gf<=g				
Opposing Queue Ratio: qro=1-Rpo(go/C)				
gq=(4.943Volc**0.762)(qro**1.061)-tl, gq<=g				
gu =g-gq if gq>=gf, =g-gf if gq<gf				
n=(gq-gf)/2, n>=0				
Ptho=1-Plto				
El*=Plt[1+{(N-1)g/(gf+gu/El1+4.24))}				
El1 (Figure 9-7)				
El2=(1-Ptho**n)/Plto, El2>=1.0				
fmin=2(1+Plt)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g][1/{1+Pl(El1-1)}], (min=fmin;max=1.00)				
flt=fm=[gf/g]+gdiff[1/{1+Plt(El2-1)}]				
[gu/g][1/(1+Plt(El1-1)],(min=fmin;max=1.0) or flt=[fm+0.91(N-1)]/N**				
flt Primary				

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Adj. LT Vol from Vol Adjustment Worksheet, v			-	
v/c ratio from Capacity Worksheet, X				
Primary phase effective green, g				
Secondary phase effective green, gq				
(From Supplemental Permitted LT Worksheet), gu				
Cycle length, C 70.0 Red =(C-g-gq-gu), r				
Arrivals: v/(3600(max(X,1.0))), qa				
Primary ph. departures: s/3600, sp				
Secondary ph. departures: s(gq+gu)/(gu*3600), ss				
XPerm				
XProt				
XCase				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 6.6 sec/veh Intersection LOS A

ERROR MESSAGES

No errors to report.