



InSync Adaptive Signal Timing Evaluation on MO 291

Lee's Summit

May 2009



InSync System Evaluation

Minor-Street Delay Study

- 4 intersections
Chipman, Tudor, Langsford, Columbus
- 3 time-of-day periods
AM Peak, AM Off Peak, PM Peak
- 20-min observations
- Each intersection observed during same time of day and day of week during before and after studies

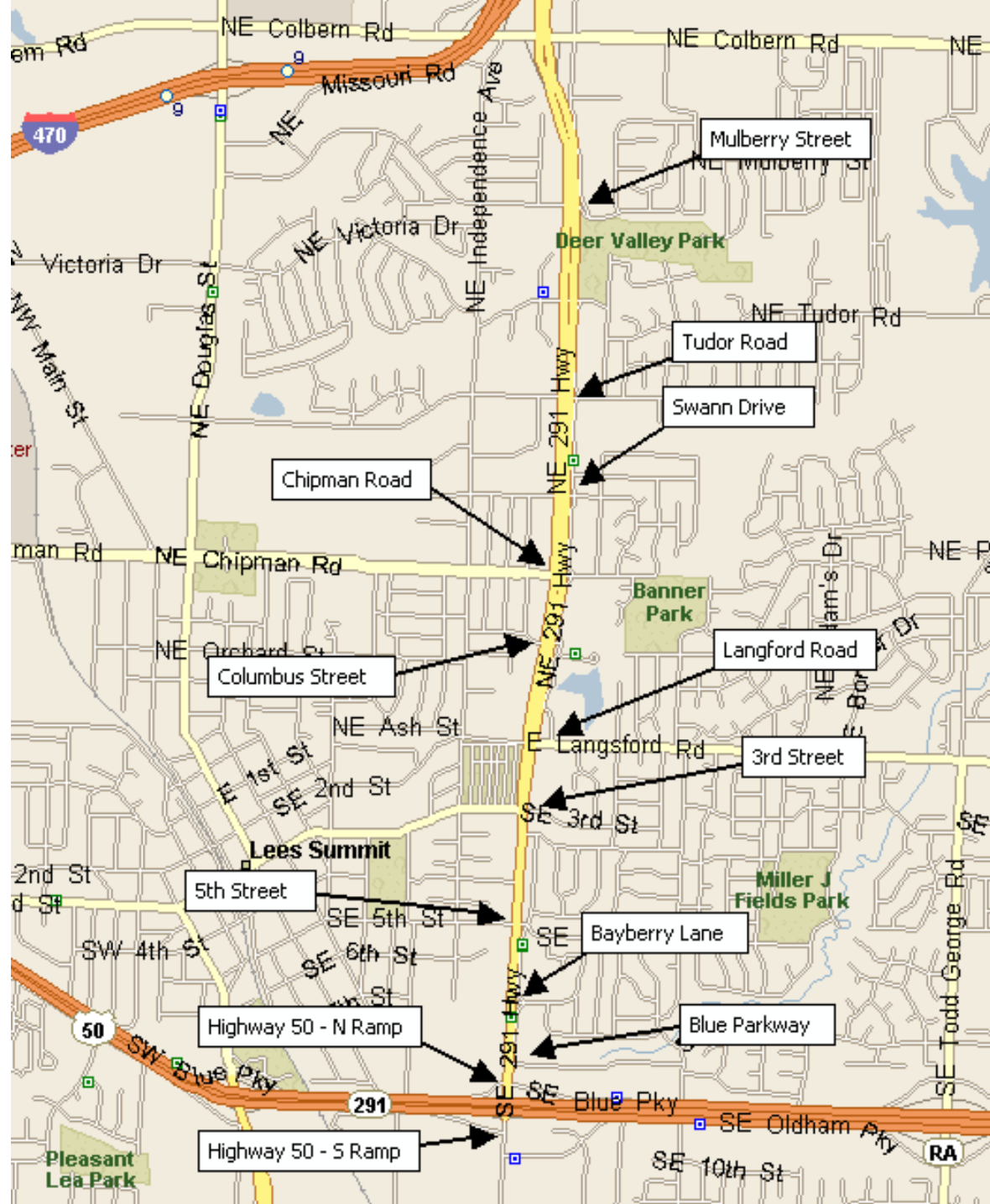
Travel Time Study

- 5 time-of-day periods
AM Peak, AM Off Peak, Noon Peak, PM Peak, Night Off Peak
- 3 days of the week
Tuesday, Wednesday, Thursday
- 4 runs in each direction
- Approx. 120 “before” runs
- Approx. 120 “after” runs
- Using PCTravel software and GPS unit

MO 291 Corridor

Intersections

- Mulberry St.
- Tudor Rd.
- Swan Dr.
- Chipman Rd.
- Columbus St.
- Langsford Rd.
- 3rd St.
- 5th St.
- Bayberry Ln.
- Blue Parkway
- US 50 Ramp (north)
- US 50 Ramp (south)





Minor-Street Delay Study

High Traffic Volume

Time of day	Approach direction	No. of observed vehicles			Avg. delay per vehicle			Percentage of total vehicles that stopped		
		Before	After	% Change	Before	After	% Change	Before	After	% Change
Tudor Road		Before	After	% Change	Before	After	% Change	Before	After	% Change
AM Peak	EB	62	99	59.7	15.5	23.9	54.2	69.4	72.7	4.8
	WB	150	206	37.3	19.5	26.4	35.4	80.0	71.8	-10.3
Off Peak	EB	150	135	-10.0	16.0	24.9	55.6	59.3	74.1	25.0
	WB	114	103	-9.6	21.9	25.5	16.4	80.7	68.9	-14.6
PM Peak	EB	308	323	4.9	29.1	26.6	-8.6	70.8	71.5	1.0
	WB	201	150	-25.4	23.7	29.4	24.1	69.2	72.0	4.0



Minor-Street Delay Study

Low Traffic Volume

Time of day	Approach direction	No. of observed vehicles			Avg. delay per vehicle			Percentage of total vehicles that stopped		
		Before	After	% Change	Before	After	% Change	Before	After	% Change
Columbus Street										
AM Peak	EB	8	10	25.0	28.0	27.2	-2.9	87.5	80.0	-8.6
	WB	34	19	-44.1	32.9	13.5	-59.0	91.2	84.2	-7.7
Off Peak	EB	19	15	-21.1	16.0	11.7	-26.9	73.7	86.7	17.6
	WB	36	24	-33.3	18.2	21.3	17.0	80.6	87.5	8.6
PM Peak	EB	36	47	30.6	33.8	35.1	3.8	83.3	80.9	-2.9
	WB	44	53	20.5	33.1	37.1	12.1	81.8	77.4	-5.4



Travel Time Study (s)

	Northbound			Southbound		
	Before	After	% Change	Before	After	% Change
Morning Peak	247.3	251.5	1.7	334.0	233.9	-30.0
Morning Off Peak	248.5	241.1	-3.0	366.2	228.1	-37.7
Noon Peak	306.5	268.7	-12.4	393.1	259.8	-33.9
Evening Peak	293.9	265.4	-9.7	344.8	290.1	-15.9
Night Off Peak	244.1	209.1	-14.3	251.2	244.0	-2.9



Average Number of Stops per Run

	Northbound			Southbound		
	Before	After	% Change	Before	After	% Change
Morning Peak	0.6	0.8	28.6	3.5	0.2	-95.2
Morning Off Peak	0.8	0.7	-7.7	4.4	0.2	-96.2
Noon Peak	1.8	0.8	-54.2	4.7	0.8	-84.0
Evening Peak	1.5	1.1	-24.7	2.6	1.4	-46.9
Night Off Peak	1.5	0.3	-83.3	1.7	1.4	-15.0



Average Speed (mph)

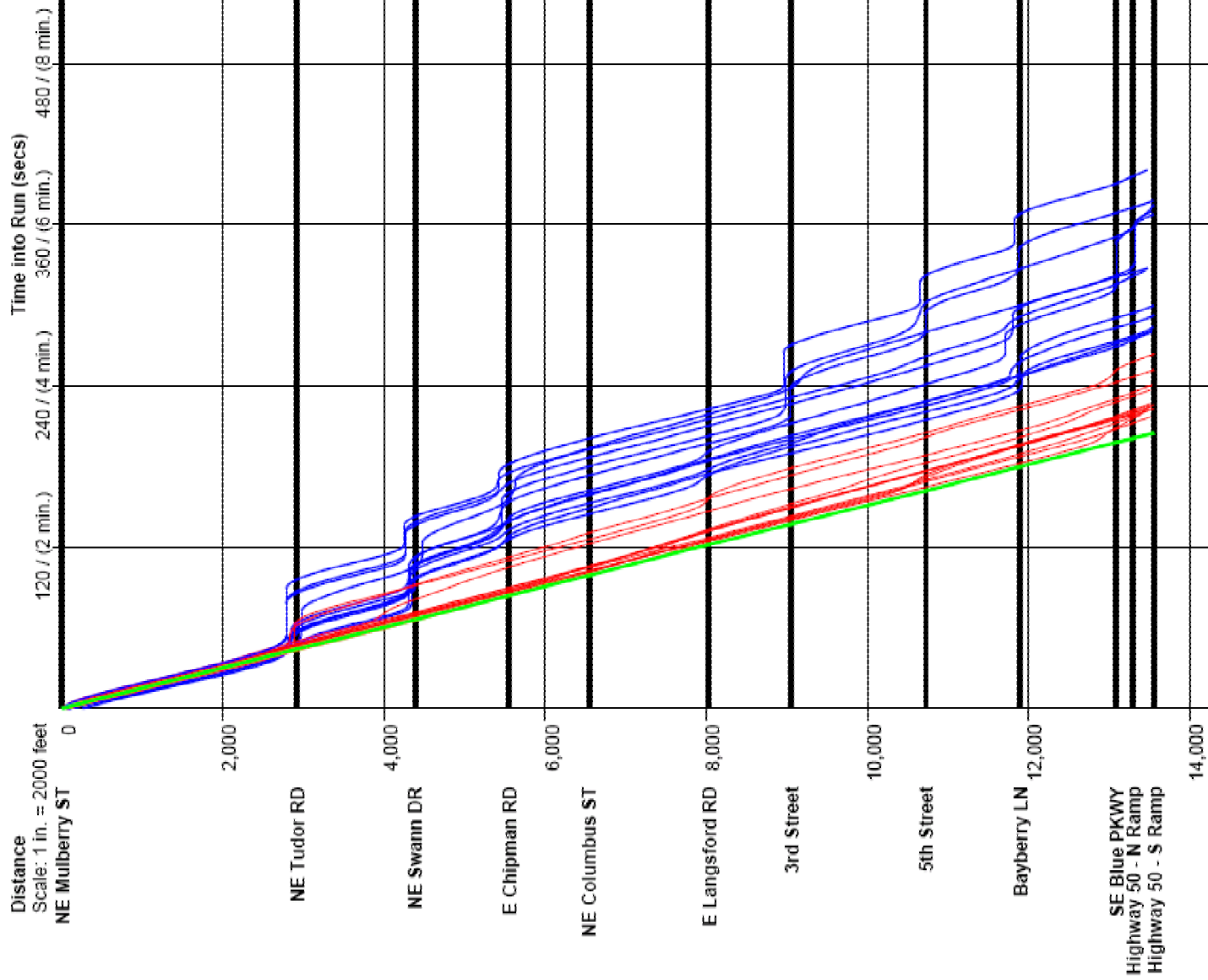
	Northbound			Southbound		
	Before	After	% Change	Before	After	% Change
Morning Peak	37.0	36.4	-1.7	27.7	39.5	42.8
Morning Off Peak	36.9	38.0	3.1	25.2	40.5	60.5
Noon Peak	29.9	34.1	14.1	23.5	35.5	51.3
Evening Peak	31.2	34.5	10.7	26.8	31.8	18.9
Night Off Peak	37.6	43.8	16.7	36.8	37.9	2.9



Graphical Representation—AM SB

Time/Space Trajectories of All Runs

Thick (blue) lines = Before Runs; Thin (red) lines = After Runs

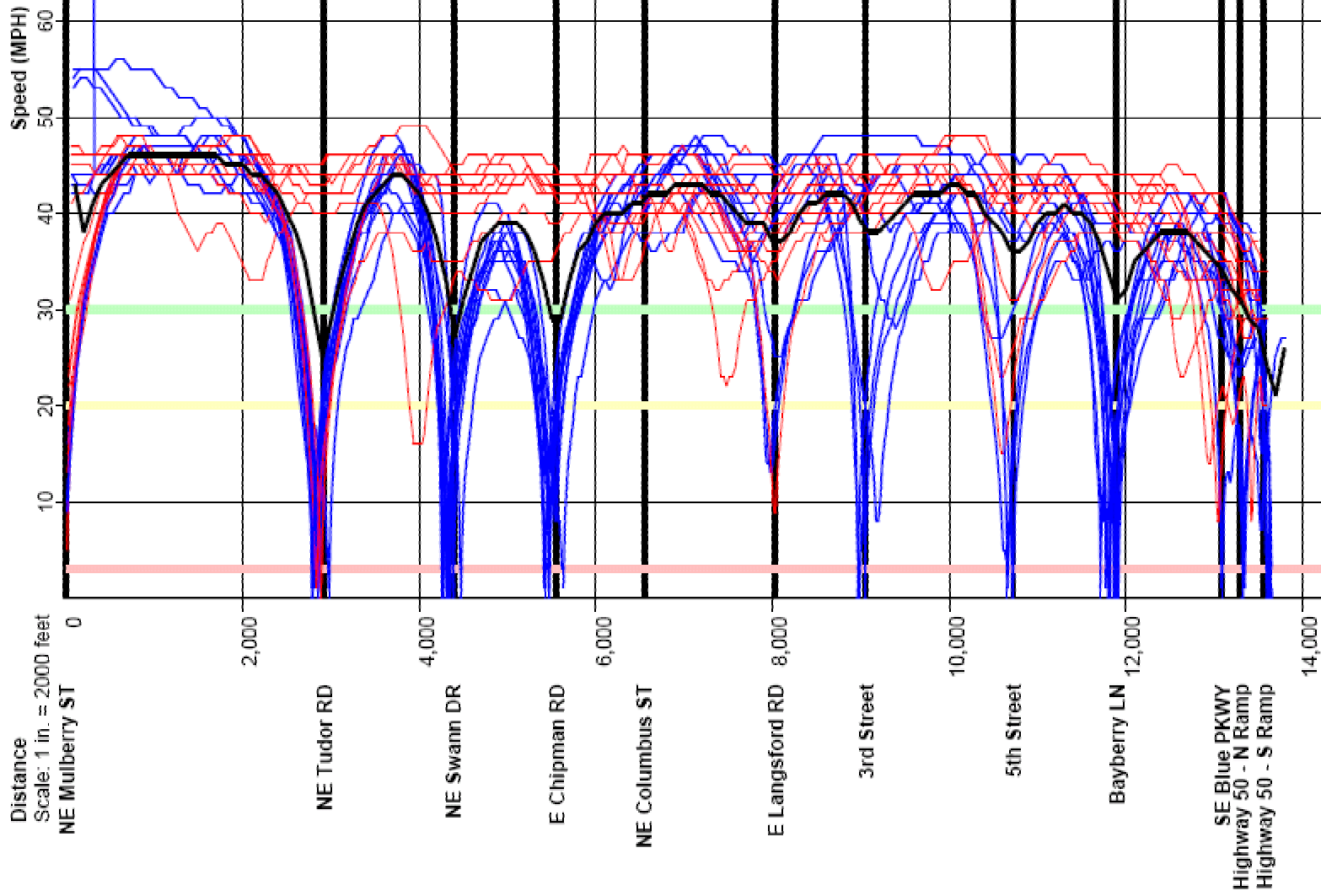




Graphical Representation—AM SB

Speed/Distance Profiles of All Runs

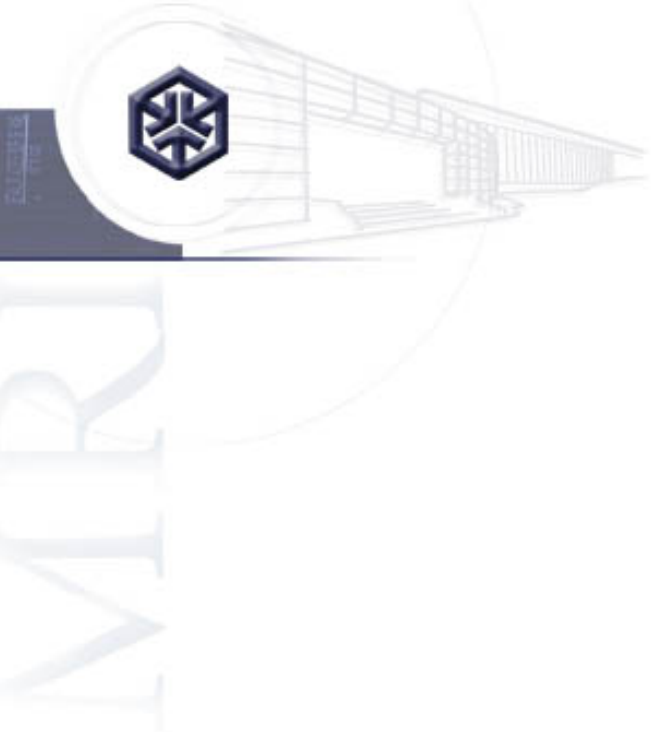
Thick (blue) lines = Before Runs; Thin (red) lines = After Runs





Preliminary Conclusions

- Minor-street delay did not appear to improve at most intersections
- Increase in minor-street delay did not appear to be substantial at most intersections
- Decrease in travel time and number of stops appear to be substantial, especially in SB direction
- Increase in average speed appears to be substantial, especially in SB direction
- Next after study scheduled for late September
- All results will be evaluated for statistical significance in analysis for final report



Thanks!

Questions?



Remaining slides are for responding to questions only—will not be presented



Minor-Street Delay Study

Time of day	Approach direction	Duration of study (min:sec)		No. of observed vehicles			Avg. delay per stopped vehicle			Avg. delay per vehicle			Percentage of total vehicles that stopped		
		Before	After	Before	After	% Change	Before	After	% Change	Before	After	% Change	Before	After	% Change
Tudor Road															
AM Peak	EB	21:20	21:20	62	99	59.7	22.3	32.9	47.5	15.5	23.9	54.2	69.4	72.7	4.8
	WB	20:00	21:20	150	206	37.3	24.4	36.8	50.8	19.5	26.4	35.4	80.0	71.8	-10.3
Off Peak	EB	21:36	21:20	150	135	-10.0	27.0	33.6	24.4	16.0	24.9	55.6	59.3	74.1	25.0
	WB	20:00	21:20	114	103	-9.6	27.1	37.0	36.5	21.9	25.5	16.4	80.7	68.9	-14.6
PM Peak	EB	21:36	21:20	308	323	4.9	41.2	37.1	-10.0	29.1	26.6	-8.6	70.8	71.5	1.0
	WB	21:36	21:20	201	150	-25.4	34.3	40.9	19.2	23.7	29.4	24.1	69.2	72.0	4.0

Time of day	Approach direction	Duration of study (min:sec)		No. of observed vehicles			Avg. delay per stopped vehicle			Avg. delay per vehicle			Percentage of total vehicles that stopped		
		Before	After	Before	After	% Change	Before	After	% Change	Before	After	% Change	Before	After	% Change
Chipman Road															
AM Peak	EB	21:20	21:20	51	57	11.8	31.6	37	17.1	22.3	29.2	30.9	70.6	78.9	11.8
	WB	20:00	21:20	34	39	14.7	25.5	31.4	23.1	20.2	20.9	3.5	79.4	66.7	-16.0
Off Peak	EB	21:20	21:36	63	84	33.3	21	35.6	69.5	18	28	55.6	85.7	78.6	-8.3
	WB	20:28	21:20	46	35	-23.9	23.4	30.9	32.1	19.8	25.6	29.3	84.8	82.9	-2.2
PM Peak	EB	21:20	21:20	121	161	33.1	36.4	31.9	-12.4	28.8	23.2	-19.4	73.8	72.7	-1.5
	WB	21:20	21:20	57	51	-10.5	37.9	37.8	-0.3	34.3	32.6	-5.0	90.5	86.3	-4.6



Minor-Street Delay Study

Time of day	Approach direction	Duration of study (min:sec)		No. of observed vehicles			Avg. delay per stopped vehicle			Avg. delay per vehicle			Percentage of total vehicles that stopped		
		Before	After	Before	After	% Change	Before	After	% Change	Before	After	% Change	Before	After	% Change
Columbus Road															
AM Peak	EB	21:20	21:36	8	10	25.0	32.0	34.0	6.3	28.0	27.2	-2.9	87.5	80.0	-8.6
	WB	20:00	21:36	34	19	-44.1	36.1	16.0	-55.7	32.9	13.5	-59.0	91.2	84.2	-7.7
Off Peak	EB	21:36	21:20	19	15	-21.1	21.7	13.5	-37.8	16.0	11.7	-26.9	73.7	86.7	17.6
	WB	20:32	21:20	36	24	-33.3	22.6	27.7	22.6	18.2	21.3	17.0	80.6	87.5	8.6
PM Peak	EB	21:20	21:36	36	47	30.6	40.5	43.4	7.2	33.8	35.1	3.8	83.3	80.9	-2.9
	WB	21:20	21:20	44	53	20.5	40.4	48.0	18.8	33.1	37.1	12.1	81.8	77.4	-5.4

Time of day	Approach direction	Duration of study (min:sec)		No. of observed vehicles			Avg. delay per stopped vehicle			Avg. delay per vehicle			Percentage of total vehicles that stopped		
		Before	After	Before	After	% Change	Before	After	% Change	Before	After	% Change	Before	After	% Change
Langsford Road															
AM Peak	EB	21:52	21:36	61	64	4.9	36.4	33.1	-9.1	32.8	29.0	-11.6	90.2	87.5	-3.0
	WB	20:16	21:20	268	271	1.1	25.6	32.4	26.6	19.3	21.5	11.4	75.4	66.4	-11.9
Off Peak	EB	21:52	21:20	75	67	-10.7	37.5	38.2	1.9	33.5	32.5	-3.0	89.3	85.1	-4.7
	WB	22:56	21:20	186	177	-4.8	24.5	26.8	9.4	20.8	18.9	-9.1	84.9	70.6	-16.8
PM Peak	EB	21:52	21:20	166	145	-12.7	48.2	50.1	3.9	39.8	42.2	6.0	82.5	84.1	1.9
	WB	21:20	21:20	212	191	-9.9	33.5	53.5	59.7	25.0	44.8	79.2	74.5	83.8	12.5



Travel Time Runs

Morning Peak Period		Travel Time (s)	Avg # of Stops	Avg Speed (mph)	Total Delay (s)	Time <= 3 MPH (s)	Time <= 20 MPH (s)	Time <= 30 MPH (s)
NB	Before	247.3	0.6	37.0	41.8	7.6	22.3	42.6
	After	251.5	0.8	36.4	44.3	12.9	26.1	45.4
	Change	4.2	0.2	-0.6	2.5	5.3	3.8	2.8
	% Change	1.7	28.6	-1.7	5.8	70.3	17.2	6.7
SB	Before	334.0	3.5	27.7	126.3	51.5	105.2	150.0
	After	233.9	0.2	39.5	24.6	1.5	8.5	22.2
	Change	-100.1	-3.3	11.8	-101.7	-50.0	-96.7	-127.8
	% Change	-30.0	-95.2	42.8	-80.5	-97.1	-91.9	-85.2

Morning Off Peak Period		Travel Time (s)	Avg # of Stops	Avg Speed (mph)	Total Delay (s)	Time <= 3 MPH (s)	Time <= 20 MPH (s)	Time <= 30 MPH (s)
NB	Before	248.5	0.8	36.9	42.1	7.0	21.5	44.8
	After	241.1	0.7	38.0	33.9	8.3	15.8	30.3
	Change	-7.4	-0.1	1.1	-8.2	1.3	-5.7	-14.5
	% Change	-3.0	-7.7	3.1	-19.4	18.7	-26.3	-32.3
SB	Before	366.2	4.4	25.2	158.7	78.2	134.3	185.3
	After	228.1	0.2	40.5	19.5	4.8	6.8	13.4
	Change	-138.1	-4.2	15.3	-139.2	-73.4	-127.5	-171.9
	% Change	-37.7	-96.2	60.5	-87.7	-93.9	-94.9	-92.8



Travel Time Runs

Noon Peak Period		Travel Time (s)	Avg # of Stops	Avg Speed (mph)	Total Delay (s)	Time <= 3 MPH (s)	Time <= 20 MPH (s)	Time <= 30 MPH (s)
NB	Before	306.5	1.8	29.9	99.7	53.4	76.5	102.0
	After	268.7	0.8	34.1	61.4	22.2	35.0	62.4
	Change	-37.8	-1.0	4.2	-38.3	-31.2	-41.5	-39.6
	% Change	-12.4	-54.2	14.1	-38.4	-58.5	-54.3	-38.8
SB	Before	393.1	4.7	23.5	185.8	104.7	162.8	206.9
	After	259.8	0.8	35.5	50.8	18.3	29.7	50.0
	Change	-133.3	-3.9	12.0	-135.0	-86.4	-133.1	-156.9
	% Change	-33.9	-84.0	51.3	-72.6	-82.6	-81.8	-75.8

Evening Peak Period		Travel Time (s)	Avg # of Stops	Avg Speed (mph)	Total Delay (s)	Time <= 3 MPH (s)	Time <= 20 MPH (s)	Time <= 30 MPH (s)
NB	Before	293.9	1.5	31.2	88.0	47.4	67.8	94.7
	After	265.4	1.1	34.5	59.6	25.8	40.1	62.8
	Change	-28.5	-0.4	3.3	-28.4	-21.6	-27.7	-31.9
	% Change	-9.7	-24.7	10.7	-32.3	-45.6	-40.9	-33.7
SB	Before	344.8	2.6	26.8	137.1	70.5	113.1	153.7
	After	290.1	1.4	31.8	81.7	25.5	56.7	94.6
	Change	-54.7	-1.2	5.0	-55.4	-45.0	-56.4	-59.1
	% Change	-15.9	-46.9	18.9	-40.4	-63.8	-49.9	-38.5