Department of Civil and Environmental Engineering

CE454 Urban Transportation Systems - Fall 2006

Final Report

Bike Scramble Signal at N Interstate & Oregon

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DISCLAIMER

"This report is the result of an academic exercise. The results and recommendations are the opinions of the student authors only."

INTRODUCTION

Portland has been a bike-friendly city for a very long time. Almost every major street in Portland has a bike lane to help keep bicyclists safe and to keep traffic moving. There are several bike paths around Portland that are completely segregated from motor vehicle traffic. These are used for commute by a growing number of bicycle enthusiasts and for recreational bike riding. Those who use bicycling for transportation may do it for a variety of reasons. It may be for exercise, perhaps they are environmentally conscious, or maybe they just cannot stand to sit in Portland traffic jams any more. Whatever the reason, Portland has become a bike town. The purpose of our report is to focus on one aspect of Portland that has been tailored for bicyclists.

The bike scramble signal on the corner of N Interstate Avenue and Oregon Street was installed by The City of Portland Office of Transportation (PDOT) and was activated on Thursday, April 8th, 2004. The purpose of the signal was to improve traffic conditions and safety at that intersection for bicyclists by allowing protected movement for bicycles. When activated, the signal stops all motor traffic (theoretically) and allows bicyclists to cross the intersection diagonally to access Interstate Avenue, Oregon Street, or Lloyd Boulevard. This intersection is a very unique application and is possibly the only one of its kind in the US. The project was funded by a $10,000 grant from the Oregon Department of Transportation's Bicycle and Pedestrian Program.

The objective of this project is to assess how the intersection is operating, how often it is used, and to then analyze our data and observations to come to a conclusion about how effective the signal has been. Our data set includes: observations and records of current usage, data collected in 2003 before the signal was installed, and data collected in 2004 after implementation. Our observed data will consist of traffic counts taken at the physical location of the intersection and from traffic video of that location.

METHODOLOGY

The data was collected during the peak usage time, which was determined (in consultation with the client) to be between the hours of 4 pm and 6pm on Tuesdays, Wednesdays, and Thursdays. For the purpose of comparison, data was also collected for Saturday, Monday, and Tuesday mornings and a Saturday afternoon. This was done to analyze any significant differences. The data collected and observed represents the number of total users of the bike scramble. It also details the direction of travel. For purposes of this study, the direction of travel is the direction the cyclist leaves the intersection from: North, South, East, or West. Example: If a cyclist coming off of the esplanade comes up to the scramble signal, activates it, crosses the intersection, and goes north they are marked as a northbound user. If they go east then they are an eastbound user. Other observations were the total number of bicyclists using the intersection, the number of users crossing the intersection illegally, and the number of automobilists who make illegal right turns during the scramble phase.

Since the scramble signal was designed for bike traffic coming off the esplanade and traveling through the intersection to go either north or east, the data was collected using a couple different

techniques. One technique was the classic sit and count. One group member observed the bike scramble intersection in person for two hours on Tuesday, Wednesday, and Thursday nights, for two weeks. This allowed us to count the bike scramble users and assess interaction with other traffic. The other technique for gathering data was video surveillance. This technique employed a video camera set up at the intersection by the Portland Department of Transportation. The camera took a time-lapse recording which made observing the intersection faster and easier. The video was taken over a four day period from Saturday, October 28th to Tuesday, October 31st, and was viewed by the team at the Portland Department of Transportation in the surveillance room. The video consisted of footage from Saturday morning between 8 am and 10 am, Saturday afternoon from 1 pm to 3 pm, and Monday and Tuesday mornings from 8 am to 10 am. The Sunday data was not used as we reasoned that it would not represent regular usage or yield much data.

RESULTS

Data

Peak hour cyclist data between 4:00 pm and 6:00 pm was originally collected in July 2003 by PDOT before the scramble signal was installed. PDOT collected data again two months and four months after implementation in June and August 2004. The results of this are summarized in Figure 1 of the Appendix.

For this project, PM peak hour data was obtained through field observation between 4:00 PM and 6:00 PM for Tuesday, October 31st to Thursday, November 2nd and for Tuesday, November 7th to Thursday November 9th. Additional data was obtained from counts of cyclists from video provided by PDOT for Saturday, October 28th, Monday October 30th and Tuesday October 31st from 8:00 AM to 10:00 AM and for Saturday, October 28th from 1:00 PM to 3:00 PM. Table 1 of the Appendix is a summation of all the data collected.

Analysis

As Figure 1 illustrates, the number of cyclists passing through the intersection against a traffic signal indication (illegally) has fallen dramatically since the introduction of the scramble signal. From PDOT's cyclist counts before the intersection was installed, 71.8% of all cyclists passed through the intersection illegally. This number has fallen to 4.2% for November 2006. An anomaly to this trend occurs during periods when cyclists approach the intersection at points other than the scramble signal. For west and south bound traffic during Saturday, Monday and Tuesday mornings, the percentage of illegal crossings were 28.1%, 5.3% and 9.6%, respectively. The abnormally high Saturday illegal crossings can be attributed to lighter motor vehicle traffic and perhaps more recreational riders. Conversely, it was observed that most illegal crossings in the pm peak period were the result of riders who were not familiar with the intersection, and did not know how to activate the bicycle phase. The fall-off of illegal crossings in that period may be due to more experienced, every-day riders who use the facility in that time frame.

One anomaly that jumps out on Figure 1 is that the August 2004 count is drastically elevated from the June 2004 count. The reason for this is that when the August data was collected, the Broadway Bridge was closed. As it turns out, the Steel Bridge attracted most of the cyclists that

would ordinarily use the Broadway Bridge (see Appendix: Figure 2). Reasoning that the number of users of the scramble intersection is closely related to the number of cyclists on the Steel Bridge, we re-normalized the August 2004 counts based on a projected "hypothetical" scenario where the Broadway Bridge was not closed, for comparison purposes.

Figure 2 shows the average bicycle traffic by time of day and direction. The morning and evening counts were averaged across the days the counts of were taken. For Saturday afternoon, cyclists headed in the north and south directions in nearly equal numbers. The morning commute saw a large number of cyclists going southbound. And the north direction held the lion's share of cyclist traffic through the intersection. Overall, the north and south directions were most critical to bicyclists due to the morning and evening commutes to and from Downtown. Interestingly, the data collected in the am peak does not balance the data in the pm peak – so either the cyclists who leave downtown in the evening go a different route in the morning, or do not necessarily travel there in the morning peak.

A concern of PDOT had been the number of illegal right turns occurring when the scramble signal was active. For the counts completed in this project, there were 30 illegal right turns for 895 scramble signals activated, or 3.3%.

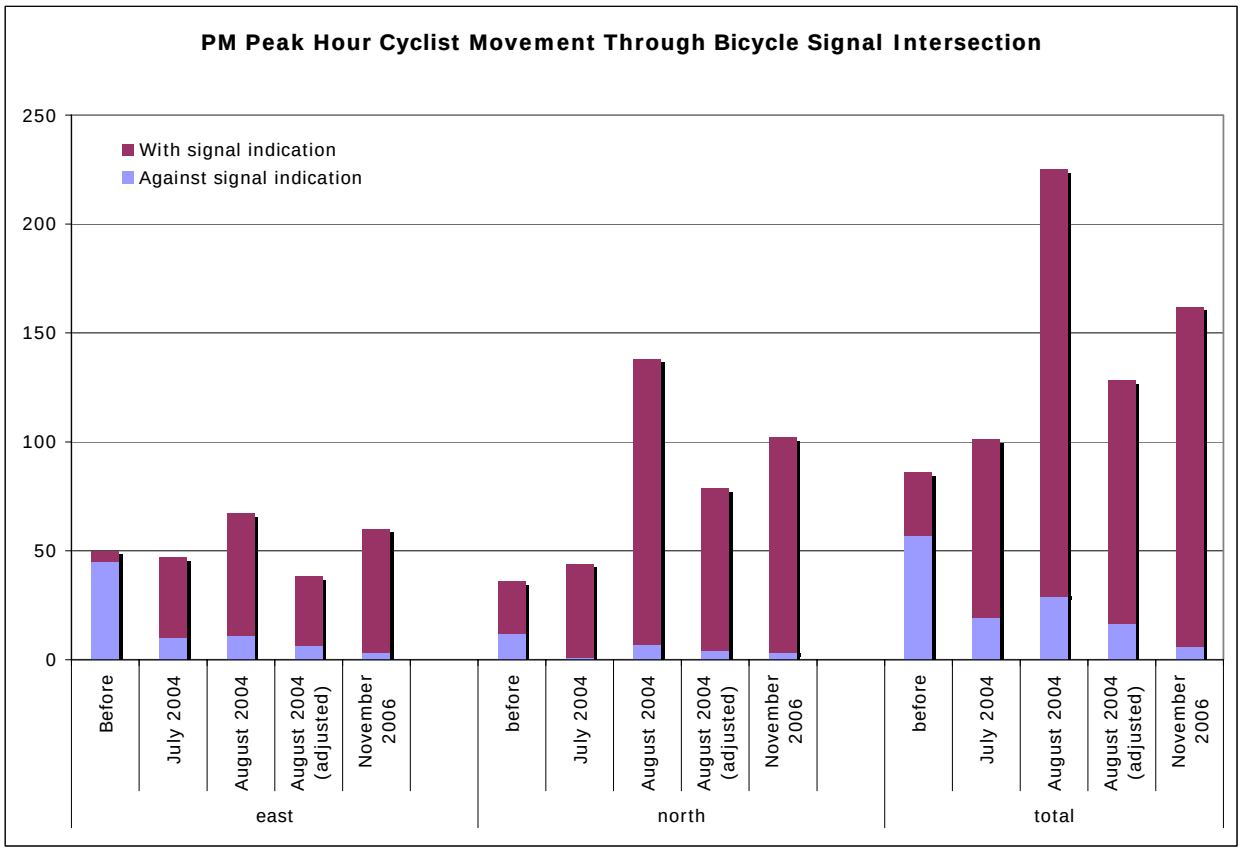
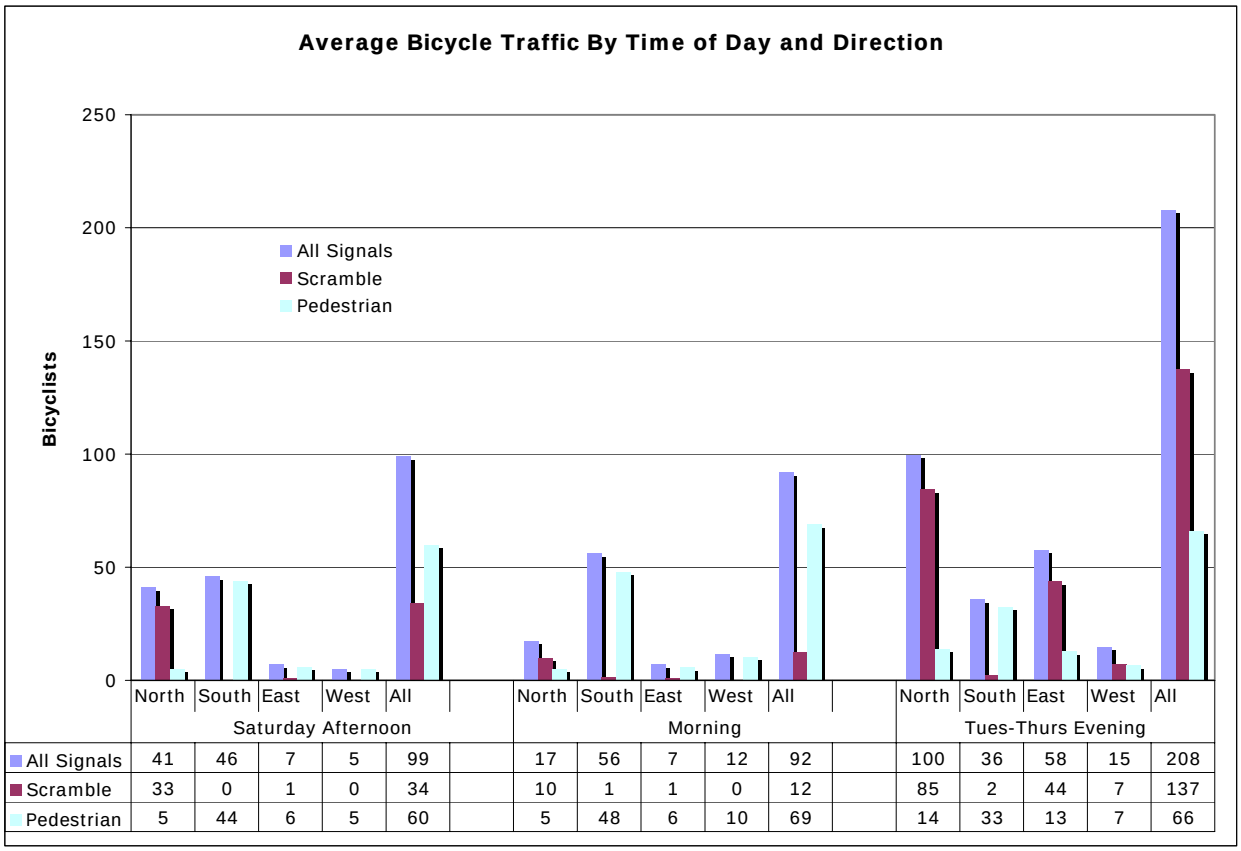


Figure 1. PM peak hour cyclist movement through Oregon & Interstate St. intersection.



	Saturday Afternoon						Morning						Tues-Thurs Evening				
	North	South	East	West	All		North	South	East	West	All		North	South	East	West	All
All Signals	41	46	7	5	99		17	56	7	12	92		100	36	58	15	208
Scramble	33	0	1	0	34		10	1	1	0	12		85	2	44	7	137
Pedestrian	5	44	6	5	60		5	48	6	10	69		14	33	13	7	66

Figure 2. Average bicycle traffic by time of day and direction.

CONCLUSION

Portland is such a bicycle friendly city that it is no wonder that they are pioneers in new and innovative ways to accommodate the large community of cyclists that commute to and from the downtown area daily. The study of this unique intersection shows how creativity and working with the community can produce a positive change for motorists and bicycle users alike. The project has effectively improved traffic conditions as well as the safety for cyclists that use this intersection. After data collection and analysis, the study has been able to deduce a few points about this unique way of handling high volumes of bike traffic. The usage of the scramble signal at N Interstate and Oregon by bicyclists has increased to more than double the volume in a little over two years. The amount of illegal crossings that go against or do not use the signal indication have significantly decreased. It appears that cyclists may take other routes into downtown during peak morning hours as scramble usage in the evening commute is significantly higher. This agrees with the signal design, which would aid in cyclists leaving downtown and with destinations to the north and east. The implementation of the scramble signal has been successful as safe and legal usage has been improved for a high cyclist volume intersection.

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APPENDIX

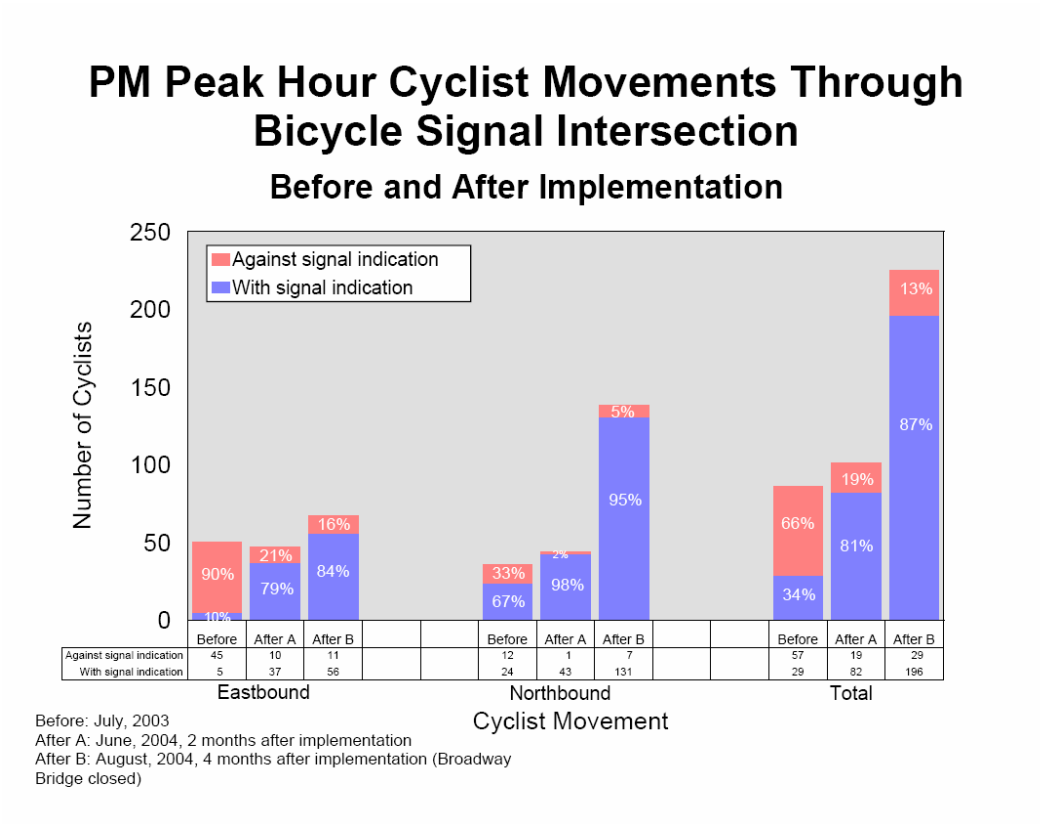
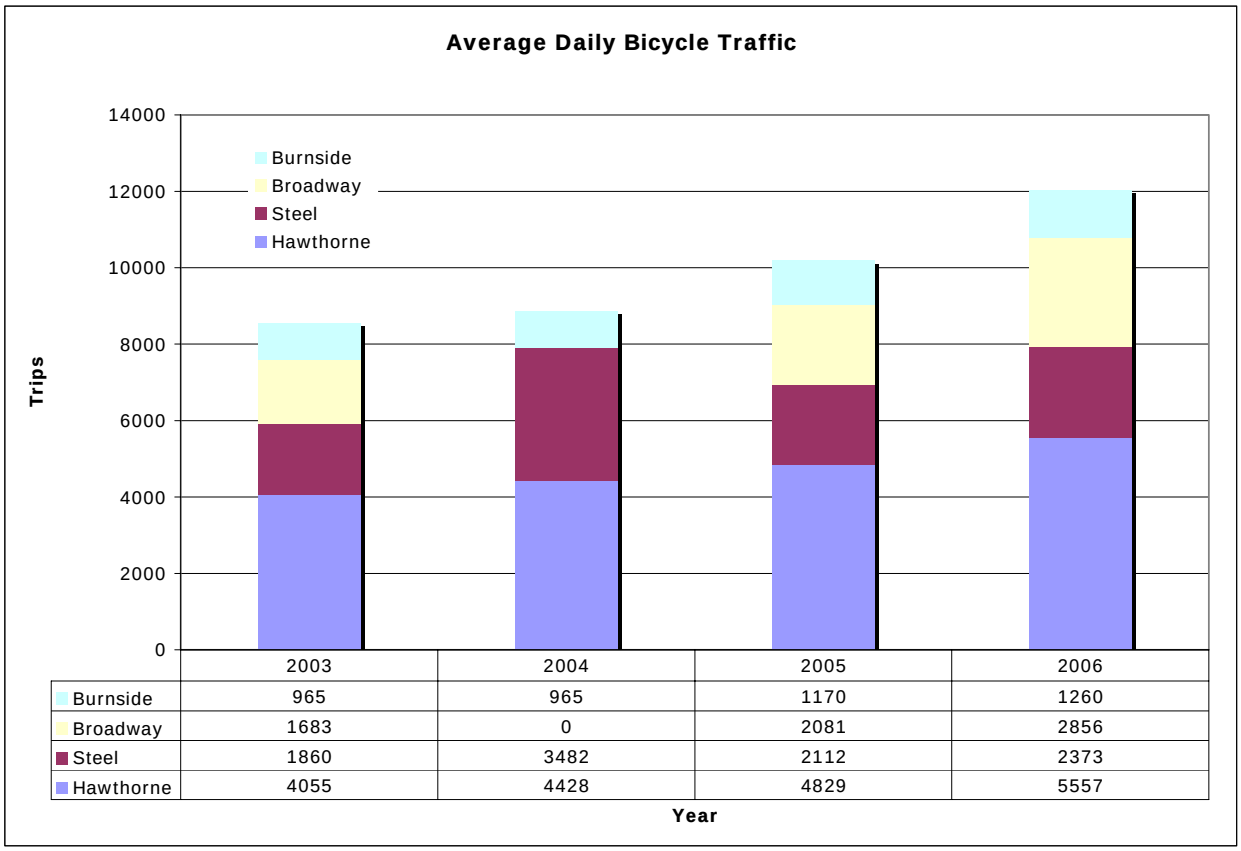


Figure 1. Before and after scramble signal implementation peak PM bicyclist data from PDOT.

Day	Saturday	Saturday	Monday	Tuesday	Tuesday	Wednesday	Thursday	Tuesday	Wednesday	Thursday
Date	10/28/2006	10/28/2006	10/30/2006	10/31/2006	10/31/2006	11/1/2006	11/2/2006	11/7/2006	11/8/2006	11/9/2006
From	*8:00 AM*	*1:00 PM*	*8:06 AM*	*8:00 AM*	*4:10 PM*	*4:00 PM*	*4:00 PM*	*4:10 PM*	*4:10 PM*	*4:15 PM*
To	*10:00 AM*	*3:00 PM*	*10:02 AM*	*10:00 AM*	*6:10 PM*	*6:00 PM*	*6:00 PM*	*6:10 PM*	*6:10 PM*	*6:15 PM*
Weather	Partly Cloudy	Sunny	Cloudy	Cloudy	Sunny & Clear	Overcast, light rain	Rainy	Rainy	Rainy	Cold and dry
Bike Scramble Count	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**
NB	4	33	11	15	121	100	52	54	77	103
SB	0	0	3	1	5	4	2	1	1	0
EB	0	1	2	1	69	53	33	29	33	45
WB	0	0	0	0	7	8	9	2	10	6
Total	4	34	16	17	202	165	96	86	121	154
Signal Cycles	4	22	12	18	55	55	38	46	47	60
Max. Bikes In 1 Cycle	1	4	2	3	11	8	5	5	8	8
Other Signals Count	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**
NB	4	5	4	7	13	12	12	15	13	19
SB	16	44	59	69	47	33	19	24	30	42
EB	5	6	9	3	13	12	11	16	10	15
WB	3	5	16	12	9	8	3	7	5	8
Total	28	60	88	91	82	65	45	62	58	84
Signal Cycles	28	47	100	98	57	56	35	51	48	66
Max. Bikes In 1 Cycle	1	3	4	6	3	3	4	3	4	3
Illegal Bike Crossings	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**	**Total Bikes**
NB	5	3	1	1	-	-	-	-	-	-
SB	4	2	6	10	-	-	-	-	-	-
EB	0	0	0	1	-	-	-	-	-	-
WB	0	0	3	1	-	-	-	-	-	-
Total	9	5	10	13	2	4	3	9	5	5
% Illegal	*28.13*	*5.32*	*9.62*	*12.04*	*0.70*	*1.74*	*2.13*	*6.08*	*2.79*	*2.10*
Illegal Rt. Turns	0	1	0	1	4	4	4	3	6	7
False Calls	-	-	-	-	-	-	2	4	1	4



	2003	2004	2005	2006
Burnside	965	965	1170	1260
Broadway	1683	0	2081	2856
Steel	1860	3482	2112	2373
Hawthorne	4055	4428	4829	5557

Figure 2. Total cyclist traffic on 4 bridges into downtown Portland, 2003 to 2006.