

Spot Safety Project Evaluation

Work Order #41000014728

Spot Safety Project # 08-06-214

**Spot Safety Project Evaluation of the Installation of a Flashing Yellow Arrow for US 64 Left Turns in Addition to a Time of Day Program to Switch the Left Turns Movements From Permissive to Protected During Peak Times
The Intersection of US 64 and NC 751/SR 1001 (New Hill Rd)
Chatham County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator



Brad Robinson, PE

10/6/2011

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-06-214 – The intersection of US 64 and NC 751/SR 1001 (New Hill Rd) in Chatham County.

The signal number for this location is 08-0419.



Project Information and Background from the Project File Folder

There were two spot safety project countermeasures chosen for the subject location. The first was to install flashing yellow arrow indicators for the left turns on US 64. The second was to use a time of day program in order to switch the left turn movements from protected/permissive to protected only during peak traffic times.

US 64 is a multi-lane divided facility with exclusive left and right turn lanes at the subject intersection. SR 1001 has a single lane approach and NC 751 has an exclusive left turn lane, one

thru lane, and a right turn slip ramp on its approach to the intersection. The speed limit is 55 mph for all approaches.

The final completion date for the improvements at the subject intersection was on May 8, 2007 with a total cost of \$16,500.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from March 1, 2007 to May 30, 2007. The before period consisted of reported crashes from January 1, 2003 through February 28, 2007 (4 years and 2 months) and the after period consisted of reported crashes from June 1, 2007 through July 31, 2011 (4 years and 2 months). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that left turn, same roadway crashes and U-turn, same roadway crashes on US 64 were the target crashes for the applied countermeasure. The target crashes are clearly identified in the before and after period collision diagrams.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	51	28	-45.1
Total Severity Index	7.02	3.38	-51.9
Target Crashes	19	10	-47.4
Target Severity Index	8.88	3.96	-55.4
Volume	28,500	22,800	-20.0
<u>Target Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	1	0	-100.0
Class B Crashes	3	3	0.0
Class C Crashes	7	1	-85.7
PDO Crashes	8	6	-25.0

The naive before and after analysis at the treatment location resulted in a 45 percent decrease in total crashes, a 47 percent decrease in target crashes, and a 20 percent decrease in average daily traffic (ADT). The before period ADT year was 2005 and the after period ADT year was 2009.

Results and Discussion

It appears that the spot safety countermeasures have been effective at reducing target crashes at the intersection. In the before period the 19 target crashes included 14 left turn, same roadway crashes

involving eastbound vehicles turning left, three (3) left turn, same roadway crashes involving westbound vehicles turning left, and two (2) U-turn crashes. The ten (10) after period target crashes included four (4) left turn, same roadway crashes involving eastbound vehicles, five (5) left turn, same roadway crashes involving westbound vehicles, and one (1) U-turn crash.

The calculated benefit to cost ratio for this project is 134.06 considering total crashes. The benefit to cost ratio considering only target crashes is 66.10. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

BENEFIT-COST ANALYSIS WORKSHEET - TOTAL

LOCATION: US 64 at NC 751		BY: bdr						
COUNTY: Chatham		DATE: 10/5/2011						
FILE NO.: SS 08-06-214								
DETAILED COST:	TYPE IMPROVEMENT - Flashing Yellow Arrow & time of day program							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
	Right-of-Way	\$16,500	10	0.149	\$2,459			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$16,500	10	0.149	\$2,459			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$300			
	TOTAL ANNUAL COST=				\$2,759			
	TOTAL COST OF PROJECT=				\$16,500			
COMPREHENSIVE COST REDUCTION:								
	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES							
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.16	2	0.48	21	5.05	28	6.73	\$432,788
AFTER	4.16	0	0.00	9	2.16	19	4.57	\$62,909
								Annual Benefits from Crash Cost Savings
								\$369,880
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$367,121	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	134.06	
TOTAL COST OF PROJECT		-	\$16,500	COMPREHENSIVE B/C RATIO		-	134.06	

BENEFIT-COST ANALYSIS WORKSHEET - TARGET

LOCATION: US 64 at NC 751		BY: bdr						
COUNTY: Chatham		DATE: 10/5/2011						
FILE NO.: SS 08-06-214								
DETAILED COST:	TYPE IMPROVEMENT - Flashing Yellow Arrow & time of day program							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
	Right-of-Way	\$16,500	10	0.149	\$2,459			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$16,500	10	0.149	\$2,459			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$300			
	TOTAL ANNUAL COST=				\$2,759			
	TOTAL COST OF PROJECT=				\$16,500			
COMPREHENSIVE COST REDUCTION:								
	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES							
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.16	1	0.24	10	2.40	8	1.92	\$207,788
AFTER	4.16	0	0.00	4	0.96	6	1.44	\$25,433
								Annual Benefits from Crash Cost Savings
								\$182,356
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$179,597	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	66.10	
TOTAL COST OF PROJECT		-	\$16,500	COMPREHENSIVE B/C RATIO		-	66.10	

Treatment Site Photos Taken September 14, 2011



Traveling westbound on US 64



Traveling eastbound on US 64



Traveling northbound on SR 1001



Traveling southbound on NC 751

ADT (YEAR)
10,000 (2005)

NC 751
55 mph

US 64 ADT (YEAR)
55 mph 19,000 (2005)

US 64 ADT (YEAR)
55 mph 18,000 (2005)

SS# 08-06-214
Order# 4100014728
Chatham County
BEFORE Period
1/1/2003-2/28/2007

SR 1001 Rd
(New Hill Rd)
55 mph

ADT (YEAR)
10,000 (2005)

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		ONLY

SIGNAL FACE I.D.

Denotes L.E.D.

21, 41, 61

22, 23
42, 43
62, 63
81, 82, 83

43

63

62

61

42

41

81

82

21

22

23

83

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: October 2011

Prepared By: bdr



ADT (YEAR)
7,300 (2009)

NC 751
55 mph

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		OILY

US 64
55 mph

ADT (YEAR)
16,000 (2009)

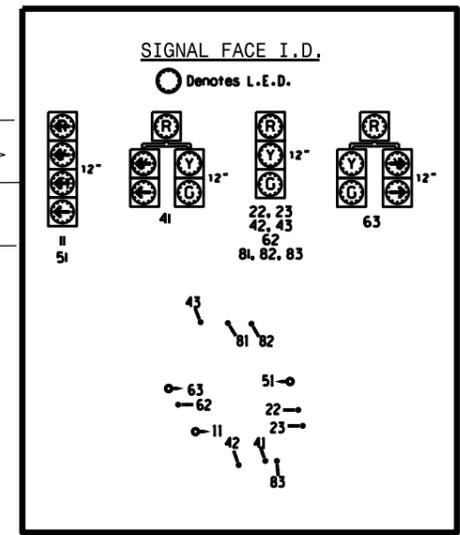
US 64
55 mph

ADT (YEAR)
15,000 (2009)

SS# 08-06-214
Order# 4100014728
Chatham County
AFTER Period
6/1/2007-7/31/2011

SR 1001 Rd
(New Hill Rd)
55 mph

ADT (YEAR)
7,300 (2009)



N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: October 2011

Prepared By: bdr

