

# Spot Safety Project Evaluation

Order # 41000017697

Spot Safety Project # 04-05-208

**Spot Safety Project Evaluation of the  
“Prepare to Stop” Pole-Mounted Flasher Installation  
US 70 Bypass / NC 111 at SR 1711 (Oak Forest Road)  
Wayne County, City of Goldsboro**

Documents Prepared By:

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

**Principal Investigator**



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Jason B. Schronce

2-24-2012

Date

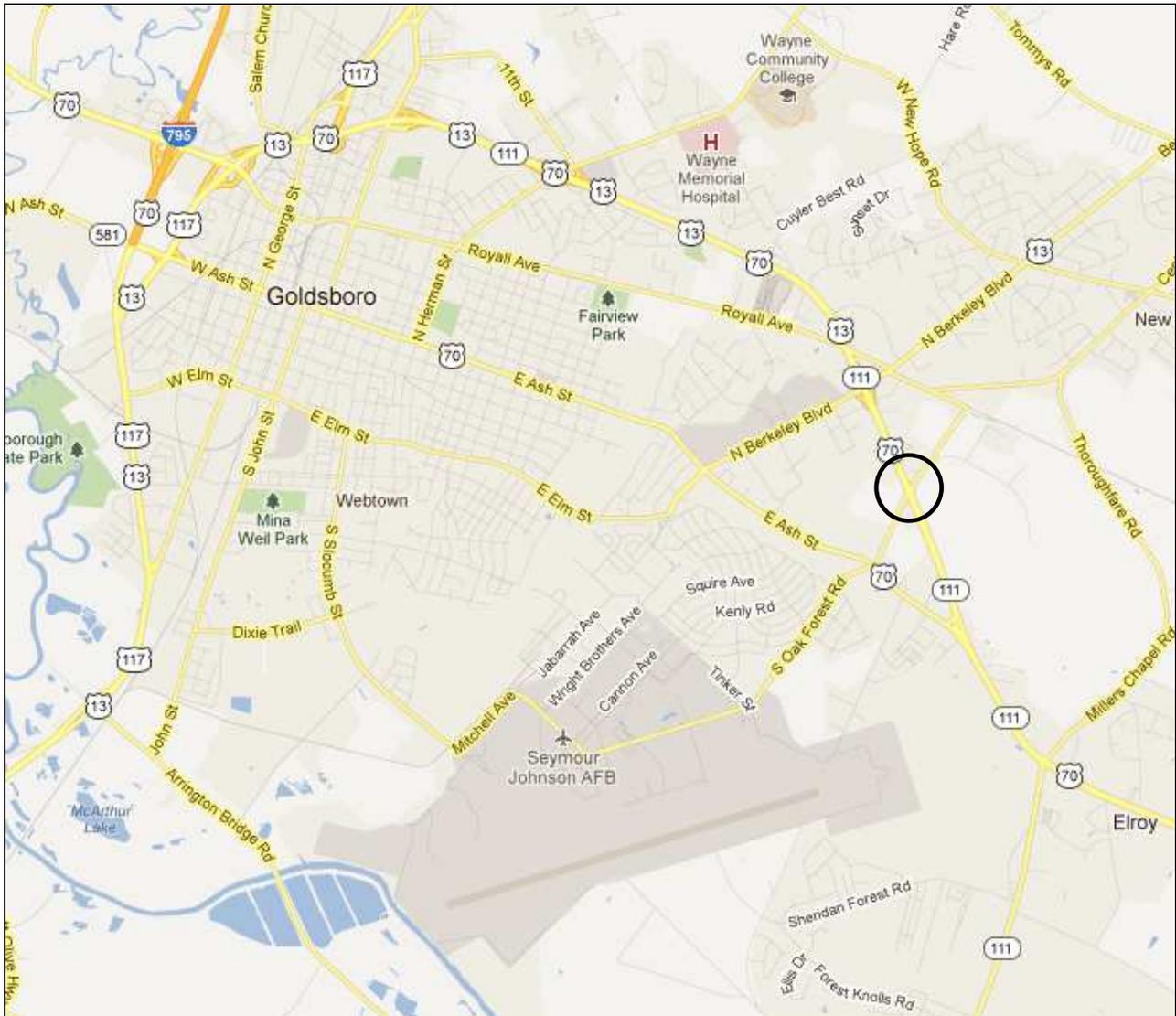
Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 04-05-208 located at the Intersection of US 70 / NC 111 and SR 1711 (Oak Forest Road) in Wayne County, City of Goldsboro.

The intersection operates under existing traffic signal Sig ID 04-0628.





**Aerial Photograph provided by Google Maps**

### **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasure chosen for the subject location was the installation of dual pole-mounted “Prepare to Stop When Flashing” flashers on both US 70 approaches to the signalized intersection. US 70 / NC 111 is a four-lane divided median highway with left and right turn lanes on both approaches and a 55 mph speed limit. SR 1711 (Oak Forest Rd) is a two-lane facility with left turn lanes at the subject intersection and a speed limit of 45 mph. The subject location is a four-leg crossroads intersection and is controlled by an existing traffic signal. This intersection is the first signal coming off a US 70 freeway segment to the east.

The original statement of problem declares that motorists on eastbound US 70 are coming off the freeway segment and running through the red-indication signal causing angle crashes. The countermeasure will bring more awareness to the existing traffic signal.

The initial crash analysis was completed from November 1, 1999 to October 31, 2004 with thirty-three (33) reported crashes. The final completion date for the improvement at the subject intersection was on February 15, 2007 with a total cost of \$27,500.

## 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 were the months of January through February 2007. The before period consisted of reported crashes from March 1, 2002 through December 31, 2006 (4 years and 10 months); and the after period consisted of reported crashes from March 1, 2007 through December 31, 2011 (4 years and 10 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes on US 70 / NC 111 within 0.1 mile of the intersection and 150 feet y-line of the subject intersection on SR 1711 (Oak Forest Road). *Please see attached location map, aerial map, and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that US-70 Rear-End Collisions and US-70 Red Light Run Angles were the target crashes for the applied countermeasure. A before period Sideswipe-Same Direction Crash (caused by hard braking of a tractor-trailer) was also included as a target collision.

<u>Treatment Information</u>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	38	35	- 7.9 %
Total Severity Index	6.50	3.96	- 39.1 %
Target Crashes	29	29	0.0 %
Target Crash Severity Index	7.44	3.55	- 52.3 %
Eastbound US-70 Rear-End Crashes	14	13	- 7.1 %
Westbound US-70 Rear-End Crashes	14	15	7.1 %
Red-Light Run Angles	1	1	0.0 %
Volume (2004, 2009)	28,700	30,000	4.5 %

<u>Injury Crash Summary</u>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	4	3	- 25.0 %
Class C Injury Crashes	14	11	- 21.4 %
Total Injury Crashes	19	14	- 26.3 %

The naive before and after analysis at the treatment location resulted in an 8 percent decrease in Total Crashes, no change in Target Crashes, and a 39 percent decrease in the Total Severity Index. The before period ADT year was 2004 and the after period ADT year was 2009.

## Results and Discussion

This site had been previously monitored by the Safety Evaluation Group through the 2.5 year mark under LOG# 200806131 in late 2009. However, a full analysis had not been completed at this intersection.

Referencing the *Collision Diagrams*, the before period presented US 70 rear-end crash patterns at the signal with 14 collisions in both directions. The before period westbound direction consisted of thirteen (13) formal rear-ends and one (1) tractor-trailer sideswipe that was braking hard and lost lane control. There was also one (1) westbound angle crash caused by a US 70 vehicle running the red light.

With the installation of the US 70 advanced flashers, the crash patterns at this location stayed the same. The after period presented thirteen (13) eastbound rear-end collisions, fifteen (15) westbound rear-end crashes, and one (1) eastbound angle crash. However, the evaluation contains a positive benefit-cost ratio from the elimination of the single A-injury before period rear-end target collision.

The calculated benefit to cost ratio for this project is **21.36 considering total crashes**. The benefit to cost ratio **considering only target crashes is 21.45**. 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*. Photos are provided from Google Street View for all four approaches to the treatment intersection. 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.

**Treatment Site Photos (from Google Maps)**



**Westbound US 70 Flasher Countermeasures**



**Westbound US 70 at SR 1711 Intersection**



**Eastbound US 70 Flasher Countermeasures**



**Eastbound US 70 at SR 1711 Intersection**



**Looking North on SR 1711 toward US 70**



**Looking South on SR 1711 toward US 70**

**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: US 70 at SR 1711		BY: JBS						
COUNTY: Wayne		DATE: 2/9/2012						
FILE NO.: SS 04-05-208								
DETAILED COST:	TYPE IMPROVEMENT -	"Prepare to Stop" Flashers						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$27,500	10	0.149	\$4,098			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$27,500	10	0.149	\$4,098			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$700			
	TOTAL ANNUAL COST=				\$6,798			
	TOTAL COST OF PROJECT=				\$27,500			
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	4.83	1	0.21	18	3.73	19	3.93	\$221,884
AFTER	4.83	0	0.00	14	2.90	21	4.35	\$76,667
						Annual Benefits from Crash Cost Savings		\$145,217
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$138,419		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	21.36		
	TOTAL COST OF PROJECT -	\$27,500		COMPREHENSIVE B/C RATIO -		21.36		

**BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes**

LOCATION: US 70 at SR 1711		BY: JBS						
COUNTY: Wayne		DATE: 2/9/2012						
FILE NO.: SS 04-05-208		US-70 Rear-End / Angle Crashes						
DETAILED COST:	TYPE IMPROVEMENT -	"Prepare to Stop" Flashers						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$27,500	10	0.149	\$4,098			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$27,500	10	0.149	\$4,098			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$700			
	TOTAL ANNUAL COST=				\$6,798			
	TOTAL COST OF PROJECT=				\$27,500			
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	4.83	1	0.21	15	3.11	13	2.69	\$204,120
AFTER	4.83	0	0.00	10	2.07	19	3.93	\$58,323
						Annual Benefits from Crash Cost Savings		\$145,797
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$138,999		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	21.45		
	TOTAL COST OF PROJECT -	\$27,500		COMPREHENSIVE B/C RATIO -		21.45		

SS# 04-05-208  
 Order# 41000017697  
 Wayne County  
 BEFORE Period  
 3/1/02 - 12/31/06

**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		70 AND UP
	RAN OFF ROAD		SPEED UNKNOWN		SPEED UNKNOWN		ONLY

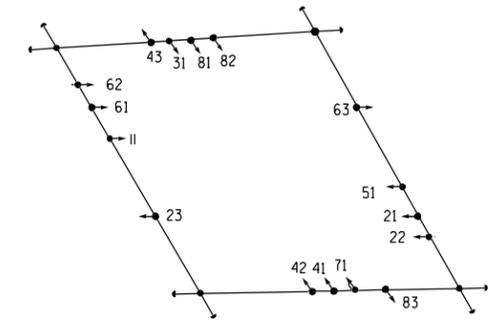
SR 1711  
 OAK FOREST ROAD  
 45-MPH  
 ADT (Year)  
 2,500 (2004)

US 70 BYPASS/NC 111  
 55-MPH

ADT (Year)  
 26,000 (2004)

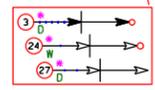
ADT (Year)  
 25,000 (2004)

ADT (Year)  
 3,900 (2004)



**SIGNAL ID 04-0628**  
 Denotes L.E.D.

11	21, 23	22, 62
31	41, 42, 43	
51	61, 63	
71	81, 82, 83	



US-70 RE/Angle  
 Target Crashes

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

**TRAFFIC SAFETY UNIT**

Date: 2-9-2012

Prepared By: J. Schronce

SS# 04-05-208  
 Order# 41000017697  
 Wayne County  
 AFTER Period  
 3/1/07 - 12/31/11

**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		70 AND UP
	RAN OFF ROAD		SPEED UNKNOWN		9 MPH OR LESS		ONLY

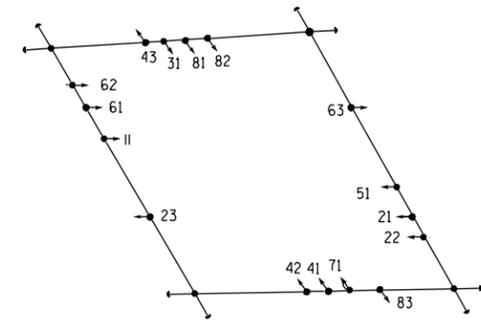
SR 1711  
 OAK FOREST ROAD  
 45-MPH  
 ADT (Year)  
 3,000 (2009)

US 70 BYPASS/NC 111  
 55-MPH

ADT (Year)  
 27,840 (2009)

ADT (Year)  
 24,720 (2009)

ADT (Year)  
 4,429 (2009)



**SIGNAL ID 04-0628**  
 Denotes L.E.D.

	11		21, 23		22, 62
	31		41, 42, 43		24, 25, 26, 27
	51		61, 63		64, 65, 66, 67
	71		81, 82, 83		

12" 12" 12" 12" 12"

BE PREPARED TO STOP  
 WHEN FLASHING

US-70 RE/Angle Target Crashes

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

**TRAFFIC SAFETY UNIT**

Date: 2-9-2012 Prepared By: J. Schronce