

# Spot Safety Project Evaluation

Order # 41000014520

Spot Safety Project # 03-03-220

## Spot Safety Project Evaluation of the Traffic Signal Installation US 117 at NC 133 (Winding Creek Road) Pender County

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

10-4-2011

Date

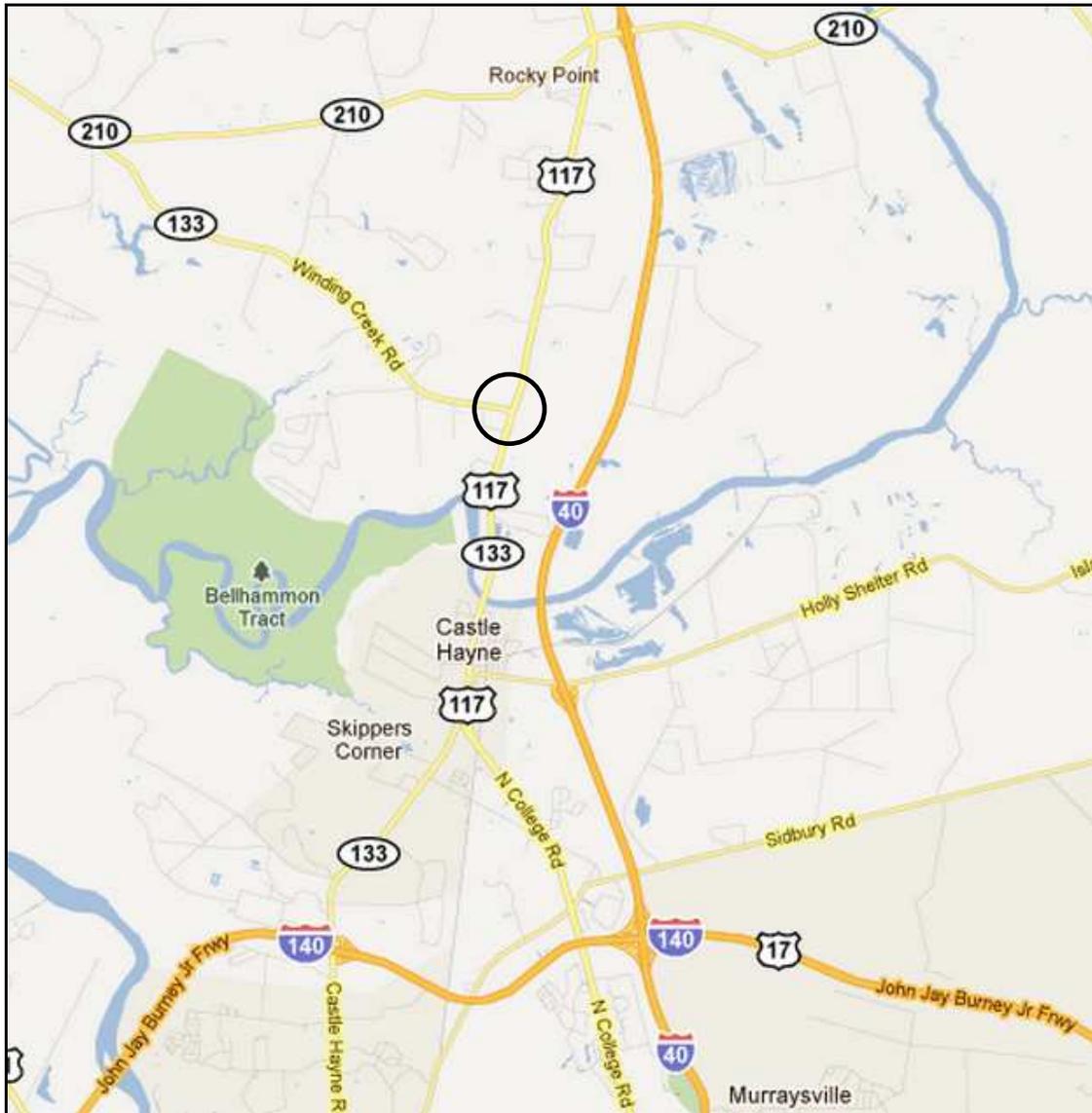
Traffic Safety Project Engineer

## *Spot Safety Project Evaluation Documentation*

### **Subject Location**

Evaluation of Spot Safety Project Number 03-03-220 located at the Intersection of US 117 and NC 133 (Winding Creek Road) / Old Blossom Ferry Road in Pender County, north of Castle Hayne.

The Sig ID is 03-0961 for this newly installed traffic signal.





**Aerial Map courtesy of Bing 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 an intersection traffic signal with protected-permitted phasing for northbound vehicles. US 117 and NC 133 (Winding Creek Road) are both two-lane facilities that widen at the subject intersection for left turn lanes and a southbound US 117 right turn slip lane. The speed limits are 55 mph on all approaches.

The subject location is a three-leg signalized intersection, which was controlled by a stop condition on NC 133 in the before period. The fourth leg of the intersection is Old Blossom Ferry Road, which is a dirt dead-end residential street that remained under stop sign control.

The original statement of problem was existence of left turn same roadway crash pattern on US 117. The intended purpose of the new traffic is to alleviate the accident frequency by installing the protected-permitted northbound signal phase. The intersection met Signal Warrants 1A, 1B, 2, and 3A. This location was also on the 2003 Highway Safety Improvement Program under HSIP Project # 70I00012.

The initial crash analysis was completed from July 1, 2000 to July 1, 2003 with twenty-two (22) reported crashes, fourteen (14) of which were deemed correctable. The final completion by the police crash reports for the improvement at the subject intersection was during the last quarter of 2005 with a total cost of \$156,000.

**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 Sept through December 2005. The before period consisted of reported crashes from March 1, 2000 through August 31, 2005 (5 years and 6 months); and the after period consisted of reported crashes from January 1, 2006 through June 30, 2011 (5 years and 6 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 within 150 feet of the subject intersection. *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 Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	51	49	- 3.9 %
Total Severity Index	6.98	6.78	- 2.9 %
Target Crashes – Frontal Impact	31	29	- 6.5 %
Target Crash Severity Index	8.22	9.48	15.3 %
Volume (2002, 2008)	15,500	16,900	9.0 %

<b><u>Injury Crash Summary</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	1	0.0 %
Class B injury Crashes	8	8	0.0 %
Class C Injury Crashes	23	20	- 13.0 %
Total Injury Crashes	32	29	- 9.4 %

The naive before and after analysis at the treatment location resulted in a 4 percent decrease in Total Crashes, a 6.5 percent decrease in Target Crashes, and a 3 percent decrease in the Total Severity Index. The before period ADT year was 2002 and the after period ADT year was 2008.

## Results and Discussion

Referencing the *Collision Diagrams*, the overall crash patterns of the intersection are consistent in the before and after periods. The obvious similarity in the diagrams is the left turn same roadway crash pattern on US 117. The before period experienced twenty-five (25) LTSR collisions while the after period had twenty-seven (27) crashes. As previously mentioned, this movement operates under protected-permissive control with a doghouse green-ball signal head. From our observations, there is plenty of sight distance and the left turn lane gives adequate storage for waiting motorists travelling northbound.

However, the traffic signal installation did help to eliminate the left turn crashes from NC 133 onto US 117 north; as there was a reduction from five (5) crashes to zero during the evaluations periods. Also, the rear-end crash pattern on the right turn NC 133 approach increased slightly from five (5) in the before period to seven (7) in the after period.

The calculated benefit to cost ratio for this project is **0.38 considering total crashes**. The benefit to cost ratio **considering only target crashes is (-0.27)**. 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 our field visit on September 29<sup>th</sup>, 2011 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**



**Travelling East on NC 133 (Winding Creek Road)**



**Travelling West on Old Blossom Ferry Road**



**Travelling North on US 117 / NC 133**



**Travelling South on US 117**

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

LOCATION: US 117 at NC 133		BY: JBS						
COUNTY: Pender		DATE: 9/30/2011						
FILE NO.: SS 03-03-220								
DETAILED COST:	TYPE IMPROVEMENT -	New Signal						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$156,000	10	0.149	\$23,249			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$156,000	10	0.149	\$23,249			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$26,349			
	TOTAL COST OF PROJECT=				\$156,000			
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	5.50	1	0.18	31	5.64	19	3.45	\$242,127
AFTER	5.50	1	0.18	28	5.09	20	3.64	\$232,000
							Annual Benefits from Crash Cost Savings	\$10,127
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	(\$16,221)	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	0.38	
TOTAL COST OF PROJECT		-	\$156,000	COMPREHENSIVE B/C RATIO		-	0.38	

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

LOCATION: US 117 at NC 133		BY: JBS						
COUNTY: Pender		DATE: 9/30/2011						
FILE NO.: SS 03-03-220		Frontal Impact Target Crashes						
DETAILED COST:	TYPE IMPROVEMENT -	New Signal						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$156,000	10	0.149	\$23,249			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$156,000	10	0.149	\$23,249			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$26,349			
	TOTAL COST OF PROJECT=				\$156,000			
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	5.50	1	0.18	20	3.64	10	1.82	\$195,091
AFTER	5.50	1	0.18	23	4.18	5	0.91	\$202,091
							Annual Benefits from Crash Cost Savings	(\$7,000)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	(\$33,349)	
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	-0.27	
TOTAL COST OF PROJECT		-	\$156,000	COMPREHENSIVE B/C RATIO		-	-0.27	

ADT (Year)  
8,200 (2002)

US-117  
55-mph

Restaurant  
PVA

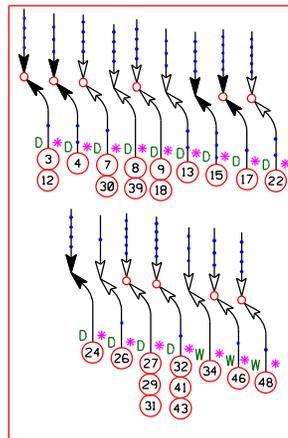
ADT (Year)  
8,700 (2002)

NC 133  
Winding Creek Rd  
55-mph

Restaurant  
PVA

US-117  
NC 133  
55-mph

ADT (Year)  
14,000 (2002)



**LEGEND**

	MOVING VEHICLE		ANGLE		5 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		HARRY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		ONLY
	RAN OFF ROAD				TO AND UP		
					SPEED UNKNOWN		

SS# 03-03-220  
 Order# 41000014520  
 Pender County  
 BEFORE Period  
 3/1/00 - 8/31/05

Old Blossom Ferry Rd  
(Dirt Rd - Dead End)

Frontal Impact  
Target Crashes

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

**TRAFFIC SAFETY UNIT**

Date: 9-30-2011

Prepared By: J. Schrone



Restaurant  
PVA

NC 133  
Winding Creek Rd  
55-mph

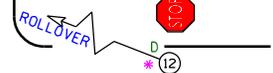
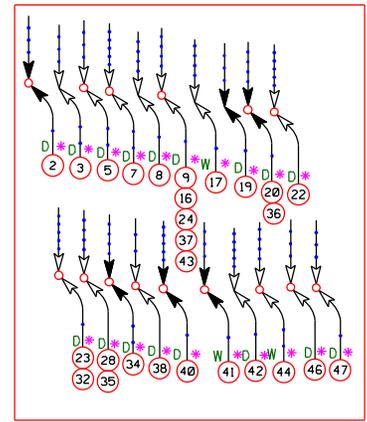
US-117  
55-mph

ADT (Year)  
8,700 (2008)

LEGEND

	MOVING VEHICLE		ANGLE		1 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		RUNAWAY		50 MPH TO 59		ICY OR SNOWY
	REAR END		RUNAWAY		60 MPH TO 69		FATALITY
	RAN OFF ROAD		FATALITY		TO AND UP		SPEED UNKNOWN

SS# 03-03-220  
Order# 41000014520  
Pender County  
AFTER Period  
1/1/06 - 6/30/11



Old Blossom Ferry Rd  
(Dirt Rd - Dead End)

ADT (Year)  
10,000 (2008)

Restaurant  
PVA

US-117  
NC 133  
55-mph

ADT (Year)  
15,000 (2008)



New  
Traffic Signal  
Sig 03-0961

⊕ Frontal Impact  
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 9-30-2011

Prepared By: J. Schronce