

Spot Safety Project Evaluation

Order # 41000014517

Spot Safety Project # 03-04-219

Spot Safety Project Evaluation of the Crossover Installation NC 24 (Beulaville Hwy) at SR 1230 (Haw Branch Road) Onslow County

Documents Prepared By:

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

Principal Investigator



Jason B. Schronce

10-12-2011

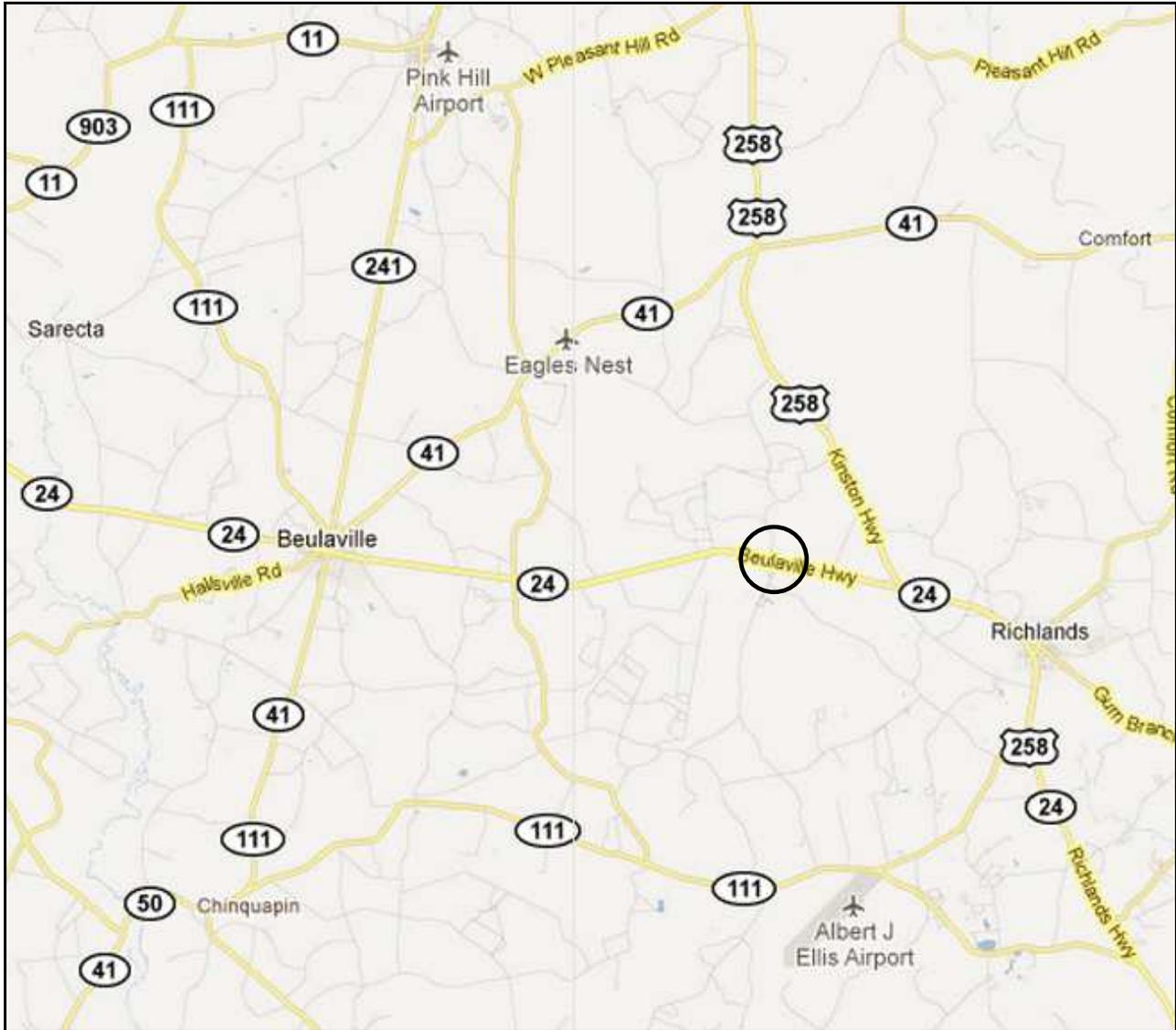
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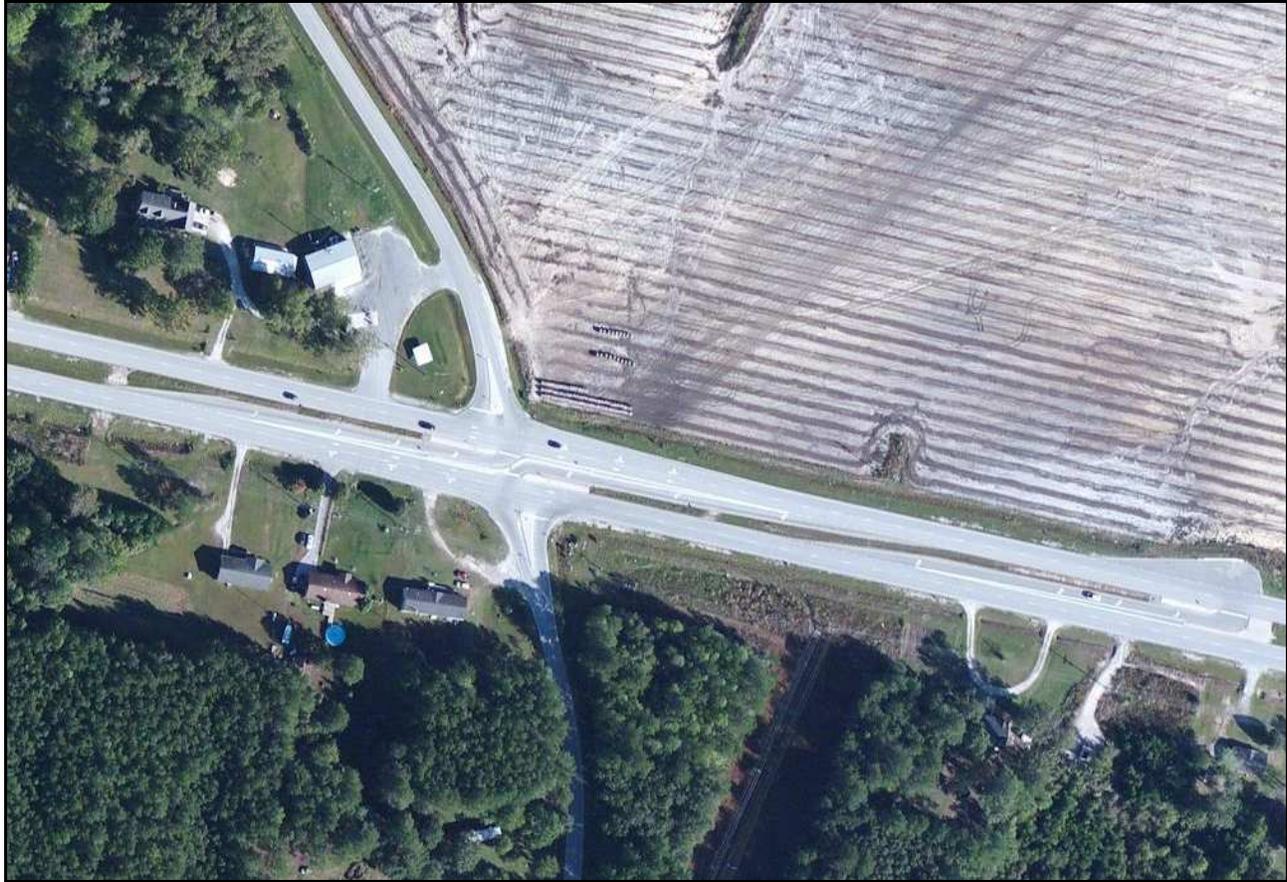
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-04-219 located at the Intersection of NC 24 (Beulaville Highway) at SR 1230 (Haw Branch Road) in Onslow County, between the Towns of Beulaville and Richlands.





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 directional crossover which allows left turns from NC 24 onto SR 1230 (Haw Branch Road). NC 24 is a four-lane median divided facility with dedicated left turn lanes at the intersection and a speed limit of 55-mph. SR 1230 is a two-lane rural roadway with a 55-mph speed limit and dual posted stop signs on both approaches. The subject location is a four-leg crossroads intersection, which is controlled by a stop condition on SR 1230.

In addition to the new crossover installation at the SR 1230 intersection, a dedicated median opening for u-turn movements was installed approximately 950 feet east of the intersection. This new opening installed an eastbound left turn lane and a bulb-out for truck movements.

The original statement of problem was the presence of crashes from side street motorists being struck on the far-side of the NC 24 crossing. This location was part of the 2003 Highway Safety Improvement Program listed under HSIP # 66I00131.

The initial crash analysis was completed from April 30, 1999 to April 30, 2004 with twelve (12) angle collisions. The final completion date for the improvement at the subject intersection was on October 23, 2007 with a total cost of \$210,000.

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 was the month of October 2007. The before period consisted of reported crashes from February 1, 2004 through September 30, 2007 (3 years and 8 months); and the after period consisted of reported crashes from November 1, 2007 through June 30, 2011 (3 years and 8 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 Crossover Related Crashes were the target crashes for the applied countermeasure. The Crossover Crash types considered are as follows: Left turn, different roadways and Angle.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	18	7	- 61.1 %
Total Severity Index	4.70	2.06	- 56.2 %
Target Crashes - Crossover	11	0	- 100.0 %
Target Crash Severity Index	5.04	0.00	- 100.0 %
Volume (2005, 2009)	8,500	9,300	9.4 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	4	0	- 100.0 %
Class C Injury Crashes	5	1	- 80.0 %
Total Injury Crashes	9	1	- 88.9 %

The naive before and after analysis at the treatment location resulted in a 61 percent decrease in Total Crashes, a 100 percent decrease of Target Crashes, and a 56 percent decrease in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2009.

Results and Discussion

Referencing the *Collision Diagrams*, the before period experienced a pattern of ten (10) angle collisions and one (1) left turn different roadway crash at the intersection. There was also a pattern of five (5) left turn same roadway crashes as NC 24 left turning vehicles chose insufficient gaps. With the directional crossover installation, the angle crashes were eliminated since the crossing

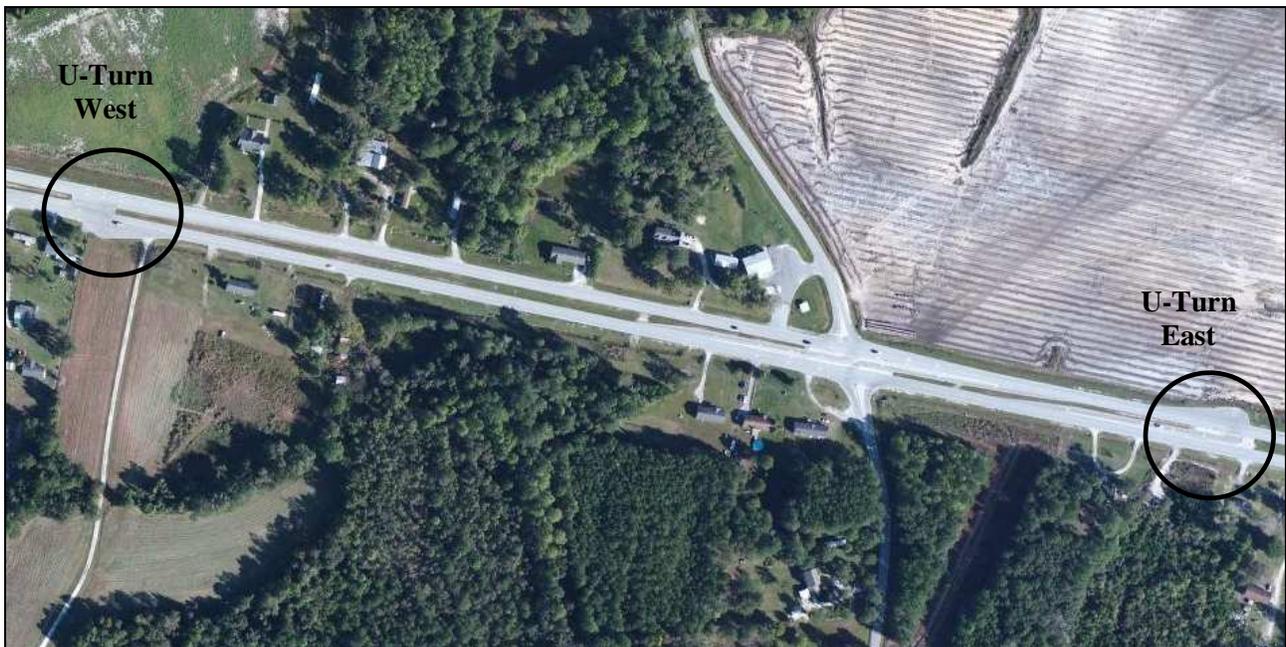
movement had been prevented. In addition, the NC 24 left turn same roadway crash pattern was eliminated even though the movement is still permitted.

The calculated benefit to cost ratio for this project is **1.50 considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.22**. 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 29th, 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.

U-Turn Location Analysis

Due to the intersection experiencing changes that limit the movement of vehicles from SR 1230 directly onto NC 24, we conducted analysis of the two closest locations for motorists to legally conduct their u-turn movements. These extra analyses were conducted with 150' y-lines and with the same time periods as the main intersection analysis.



The **U-Turn East location**, as previously discussed, is a new median opening located approximately 950 feet east of the subject crossover. The new median opening provided a new left turn lane and a bulb-out for trucks to successfully complete the u-turn movement.

The **U-Turn West location** is a paved median opening positioned approximately 0.36 mile west of the subject intersection. The median was present in the before period and has dedicated left turn lanes from both directions of NC 24. Additionally in the after period, a bulb-out was added on the south shoulder of the roadway to assist trucks in making the u-turn movement.

The Safety Evaluation Group conducted analysis of both u-turn locations and did not discover any crashes that had occurred during the study time limits.

Field Visit Observation – 9/29/2011

During the field review, the Safety Evaluation discovered a situation where vehicles were not waiting until the official U-Turn West location to cross the median. The following aerial and photo show where multiple vehicles (perhaps daily) have created the crossing approximately 525 feet west of the SR 1230 (Haw Branch Road) intersection.



Treatment Site Photos



Travelling East on NC 24 at SR 1230



Travelling West on NC 24 at SR 1230



Travelling North on SR 1230 at NC 24



Travelling South on SR 1230 at NC 24



U-Turn East Location



U-Turn West Location

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 24 at SR 1230		BY: JBS							
COUNTY: Onslow		DATE: 10/11/2011							
FILE NO.: SS 03-04-219									
DETAILED COST:	TYPE IMPROVEMENT -	Directional Crossover							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$210,000	10	0.149	\$31,296				
	Right-of-Way	\$0	0	0.000	\$0				
		\$0	0	0.000	\$0				
	TOTALS	\$210,000	10	0.149	\$31,296				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$31,496				
	TOTAL COST OF PROJECT=				\$210,000				
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	3.67	0	0.00	9	2.45	9	2.45	\$59,591	
AFTER	3.67	0	0.00	1	0.27	6	1.63	\$12,480	
								Annual Benefits from Crash Cost Savings	\$47,112
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$15,616		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	1.50		
TOTAL COST OF PROJECT		-	\$210,000	COMPREHENSIVE B/C RATIO		-		1.50	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: NC 24 at SR 1230		BY: JBS							
COUNTY: Onslow		DATE: 10/11/2011							
FILE NO.: SS 03-04-219		Targets - Left Turn Different and Angles							
DETAILED COST:	TYPE IMPROVEMENT -	Directional Crossover							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$210,000	10	0.149	\$31,296				
	Right-of-Way	\$0	0	0.000	\$0				
		\$0	0	0.000	\$0				
	TOTALS	\$210,000	10	0.149	\$31,296				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
	TOTAL ANNUAL COST=				\$31,496				
	TOTAL COST OF PROJECT=				\$210,000				
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	3.67	0	0.00	6	1.63	5	1.36	\$38,556	
AFTER	3.67	0	0.00	0	0.00	0	0.00	\$0	
								Annual Benefits from Crash Cost Savings	\$38,556
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						=	\$7,060		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						=	1.22		
TOTAL COST OF PROJECT		-	\$210,000	COMPREHENSIVE B/C RATIO		-		1.22	



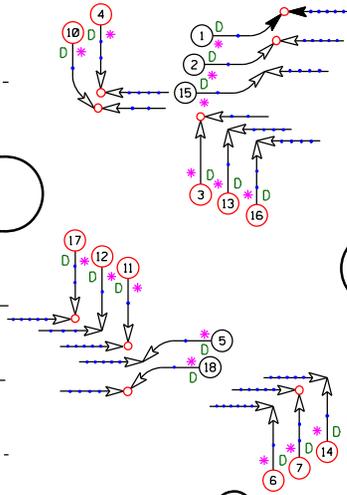
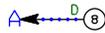
ADT (Year)
1,100 (2005)



SR 1230
Haw Branch Rd
55-mph



ADT (Year)
7,300 (2005)



ADT (Year)
7,900 (2005)

NC 24
Beulaville Hwy
55-mph



ADT (Year)
770 (2005)

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
	FIXED OBJECT		SIDESWIPE		30 MPH TO 39		DRY
	HEAD ON		OUT OF CONTROL		40 MPH TO 49		WET
	REAR END		HURRY		50 MPH TO 59		ICY OR SNOWY
	RAN OFF ROAD		FATALITY		60 MPH TO 69		ONLY
					TO AND UP		
					SPEED UNKNOWN		

SS# 03-04-219
Order# 41000014517
Onslow County
BEFORE Period
2/1/04 - 9/30/07

Crossover
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 9-9-2011 Prepared By: J. Schronce



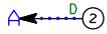
ADT (Year)
860 (2009)



SR 1230
Haw Branch Rd
55-mph



NC 24
Beulaville Hwy
55-mph

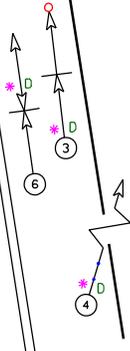


ADT (Year)
8,500 (2009)

ADT (Year)
8,000 (2009)



ADT (Year)
1,200 (2009)



LEGEND

	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED 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		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD		TO AND UP		70 AND UP		ONLY

SS# 03-04-219
Order# 41000014517
Onslow County
AFTER Period
11/1/07 - 6/30/11

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

TRAFFIC SAFETY UNIT

Date: 9-9-2011

Prepared By: J. Schronce

Crossover
Target Crashes