

# Spot Safety Project Evaluation

Order # 41000007041

Spot Safety Project # 03-02-213

## Spot Safety Project Evaluation of the Construction of a Left Turn Lane on Northbound US 17 at its Intersection with Fairway Rd 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**



Brad Robinson, PE

7/15/2010

Date

Traffic Safety Project Engineer

# *Spot Safety Project Evaluation Documentation*

## **Subject Location**

Evaluation of Spot Safety Project Number 03-02-213 – The Intersection of US 17 and Fairway Rd in Onslow County.



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

The spot safety project improvement countermeasure chosen for the subject location was the installation of a left turn lane on the northbound approach of US 17. The Spot Safety Project originally proposed to also construct a right turn lane on the northbound approach, but due to lack of funding and need it was not constructed.

The subject location is a four-leg intersection which is controlled by stop signs on Fairview Rd. US 17 is a four-lane divided facility that had existing left and right turn lanes on the southbound approach. Fairway is a two-lane non-system road.

The original statement of problem was that Rear-End Crashes were occurring due to northbound vehicles on US 17 attempting to make left turns.

The initial crash analysis was conducted from February 1, 1999 to January 31, 2002 with a total of six reported crashes, all of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on May 4, 2005 with a total cost of \$66,000.00.

### 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, 2005 to May 31, 2005. The before period consisted of reported crashes from April 1, 2000 through February 28, 2005 (4 years and 11 month) and the after period consisted of reported crashes from June 1, 2005 through April 30, 2010 (4 years and 11 month). 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 both Left Turn-Same Roadway Crashes involving northbound vehicles turning left and Rear-End Crashes occurring in the left-hand northbound lane were the Target Crashes for the applied countermeasure.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	15	25	66.7
Total Severity Index	4.45	3.37	-24.3
Target Crashes	4	2	-50.0
Target Crash Severity Index	2.85	1	-64.9
Volume	23,000	26,000	13.0
<b><u>Crash Severity Summary</u></b>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	0	0	N/A
Class C Crashes	1	0	-100.0
PDO Crashes	3	2	-33.3

The naive before and after analysis at the treatment location resulted in a 67 percent increase in Total Crashes, a 50 percent decrease in Target Crashes, and a 13 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2002 and the after period ADT year was 2007.

## Results and Discussion

The summary results on the previous page demonstrate that although Total Crashes appear to have increased at the subject intersection, Target Crashes actually experienced a decrease from the before to the after period.

The calculated benefit to cost ratio for this project is -1.17 considering total crashes. The benefit to cost ratio considering only target crashes is 1.11. 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.

In the before period all four Target Crashes were Rear-End Crashes resulting from traffic slowing or stopping at the intersection. The Target Crashes in the after period consisted of one Rear-End Crash in the left turn lane and one Left Turn-Same Roadway Crash.

There were a couple non-Target Crash patterns that became larger in the after period. One pattern was Left Turn-Same Roadway Crashes involving southbound US 17 vehicles turning left. There were three of these types of crashes in the before period and six in the after period. The second pattern was Angle Crashes involving vehicles traveling across the intersection from the northwest leg of Fairview Rd. In the before period there were two crashes of this type, both involving northbound US 17 vehicles. In the after period there were seven crashes of this type, four involving northbound US 17 vehicles and three involving southbound US 17 vehicles.

Please see the attached *Treatment Site Photos*. Photos were obtained from Google Street-view. 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**

LOCATION: US 17 at Fairway Rd  
 COUNTY: Onslow  
 FILE NO.: SS 03-02-213

BY: bdr  
 DATE: 7/7/2010

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$66,000	10	0.149	\$9,836
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$66,000</b>	<b>10</b>	<b>0.149</b>	<b>\$9,836</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$400  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0  
 TOTAL ANNUAL COST= \$10,236  
 TOTAL COST OF PROJECT= \$66,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	4.92	0	0.00	7	1.42	8	1.63	\$35,447
AFTER	4.92	0	0.00	8	1.63	17	3.46	\$47,378

Annual Benefits from Crash Cost Savings (\$11,931)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$22,167)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -1.17

TOTAL COST OF PROJECT - \$66,000 COMPREHENSIVE B/C RATIO - -1.17

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: US 17 at Fairway Rd  
 COUNTY: Onslow  
 FILE NO.: SS 03-02-213 Target Crashes Only

BY: bdr  
 DATE: 7/7/2010

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$66,000	10	0.149	\$9,836
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$66,000</b>	<b>10</b>	<b>0.149</b>	<b>\$9,836</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$400
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$0
<b>TOTAL ANNUAL COST=</b>	<b>\$10,236</b>
<b>TOTAL COST OF PROJECT=</b>	<b>\$66,000</b>

COMPREHENSIVE COST REDUCTION:

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	
BEFORE	4.92	0	0.00	3	0.61	1	0.20	\$13,069
AFTER	4.92	0	0.00	0	0.00	2	0.41	\$1,748

Annual Benefits from Crash Cost Savings \$11,321

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$1,085

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.11

TOTAL COST OF PROJECT - \$66,000 COMPREHENSIVE B/C RATIO - 1.11

## Treatment Site Photos from Google Street-View



Looking East on US 17



Looking West on US 17



Looking North on Fairview



Looking South on Fairview

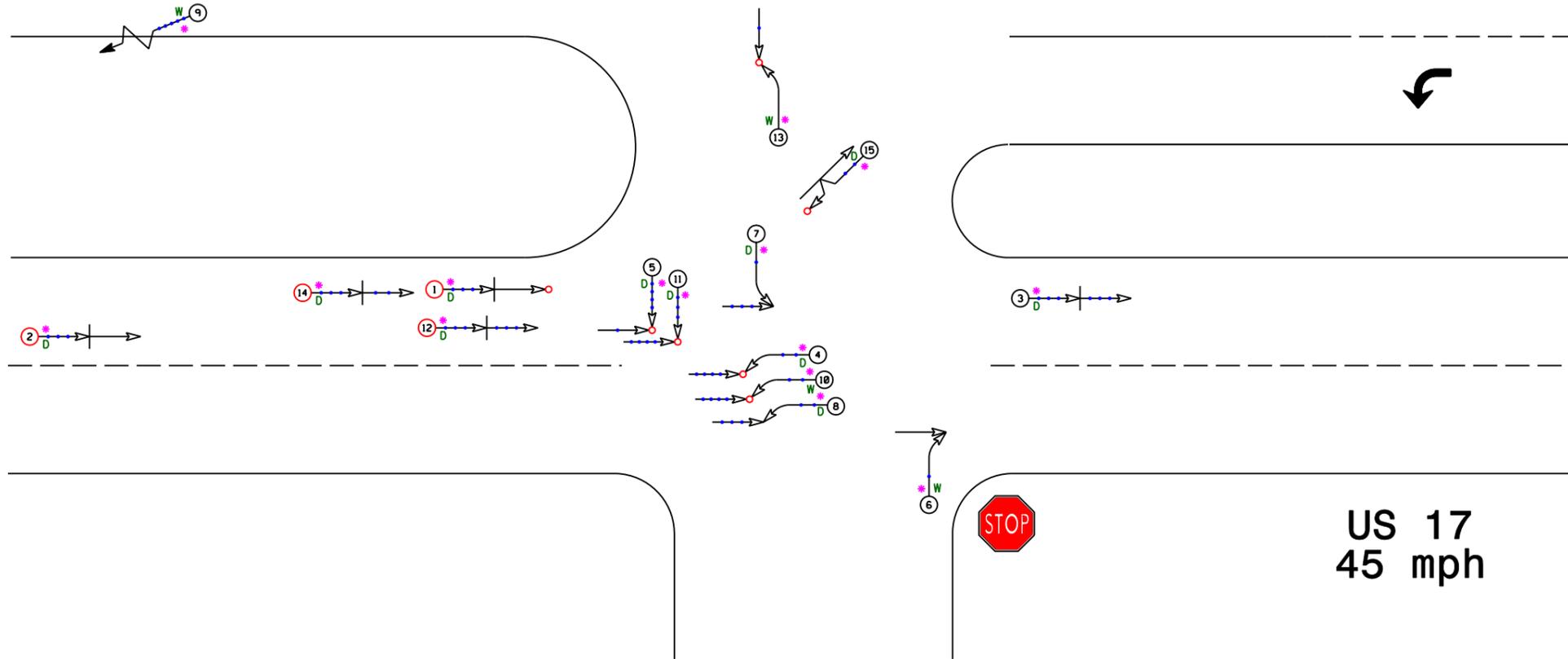
SS# 03-02-213  
 Order# 41000007041  
 Onslow County  
 BEFORE Period  
 4/1/00-2/28/05

US 17  
 45 mph



Fairview Rd

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



US 17  
 45 mph



Fairview Rd



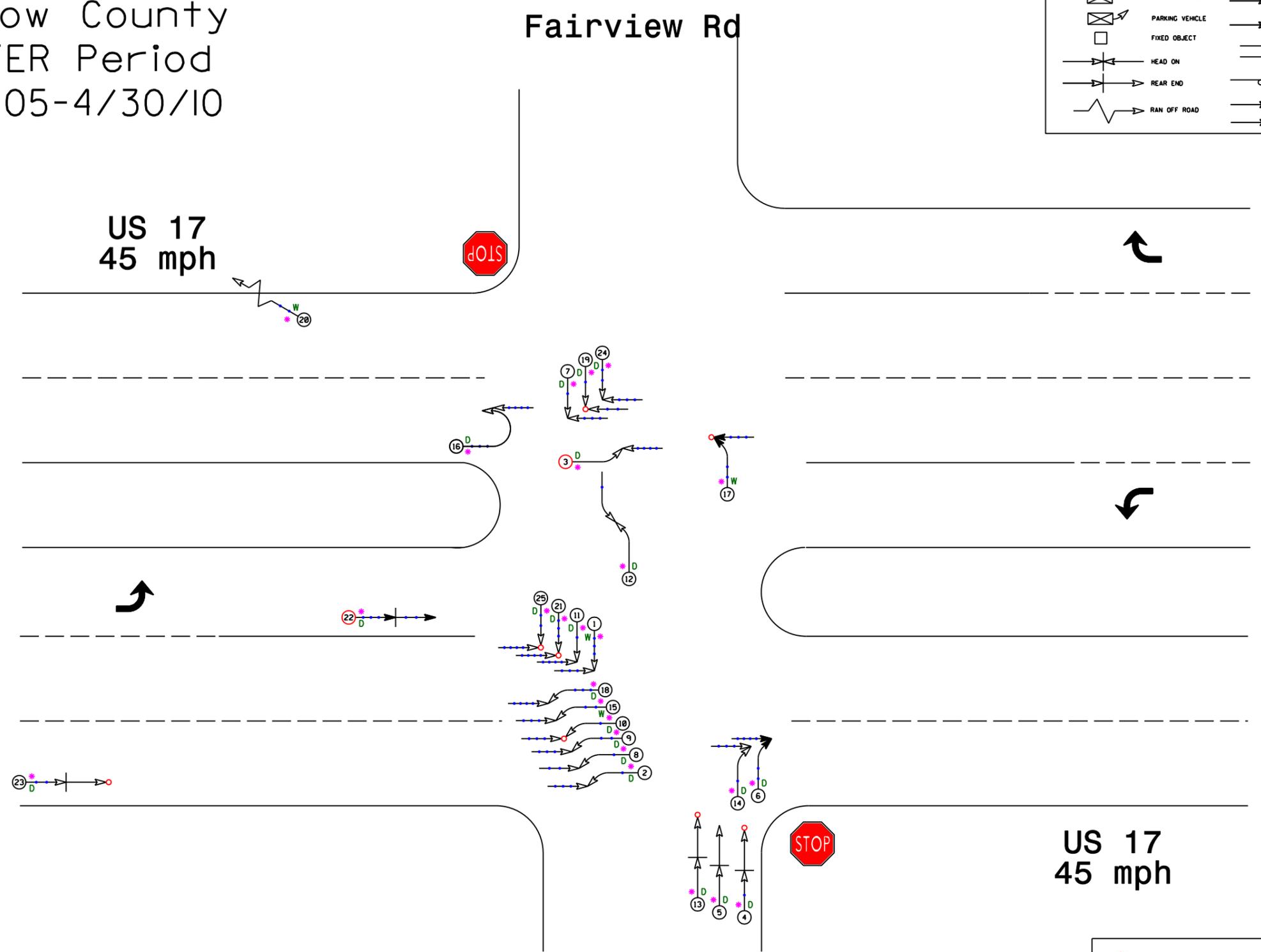
**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRANSPORTATION MOBILITY and SAFETY DIVISION**

**TRAFFIC SAFETY UNIT**

Date: June 2010      Prepared By: BDR

SS# 03-02-213  
 Order# 41000007041  
 Onslow County  
 AFTER Period  
 6/1/05-4/30/10

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



# Target Crashes

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

**TRAFFIC SAFETY UNIT**

Date: June 2010 Prepared By: BDR