

# Spot Safety Project Evaluation

Order # 41000015600

Spot Safety Project # 05-05-223

**Spot Safety Project Evaluation of the Guardrail Installation along the North Shoulder of  
SR 1007 (Poole Rd), 0.1 miles east of SR 2505 (Lake Myra Rd)  
Wake 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

12/9/2011

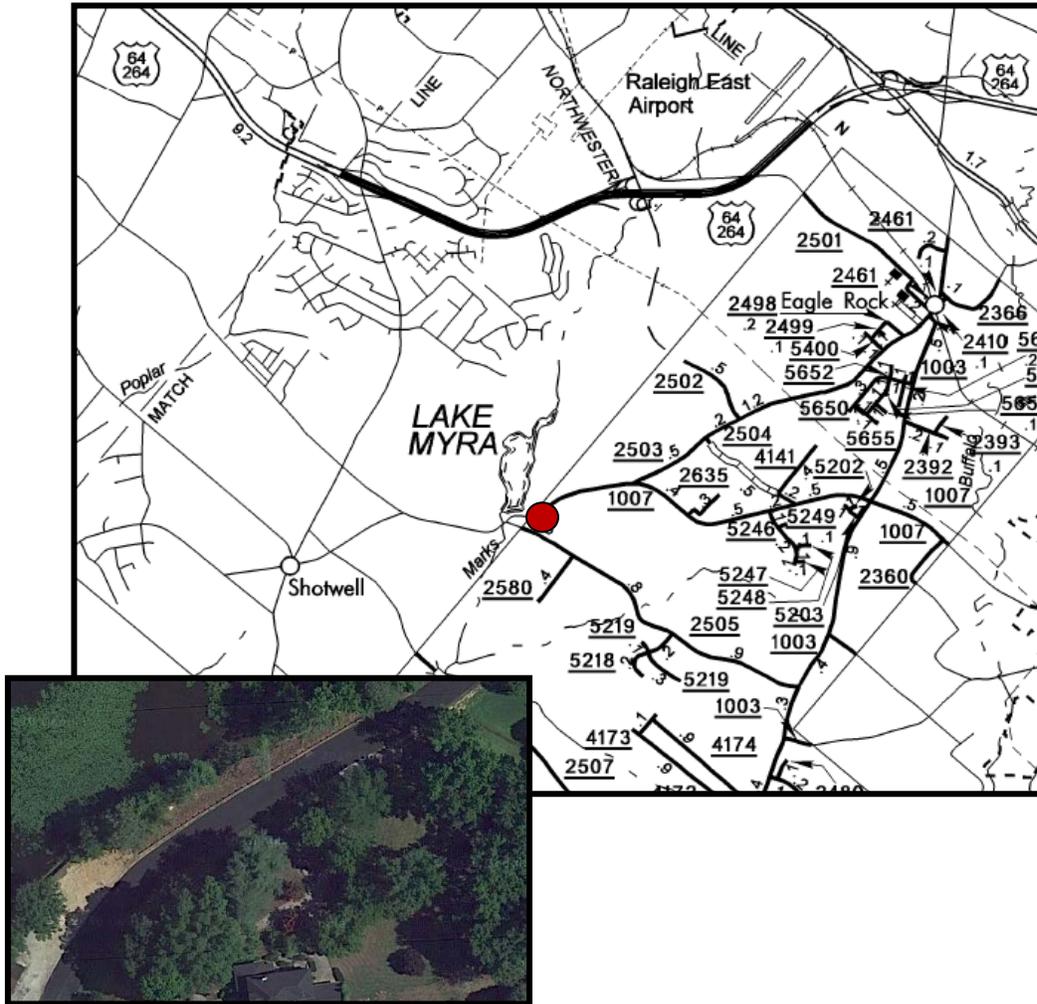
Date

Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 05-05-223 – SR 1007 (Poole Rd), approximately 0.1 miles east of SR 2505 (Lake Myra Rd) in Wake County.



## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to install approximately 300 feet of guardrail on the northern shoulder of SR 1007.

SR 1007 is a two-lane rural route with a speed limit of 45 mph. There is a ‘moderate to severe’ horizontal curve on the northeast approach to this section and a 5-6 feet dropoff into a lake surrounded by trees on the north shoulder of the section. In 2001 a fatal crash occurred at this location.

In late 2005 the division implemented other changes at the subject location. These changes included shoulder repair to an area on the north shoulder near Lake Myra, the installation of additional reverse curve warning signs with 35 mph advisories, and the installation of a large arrow warning sign for eastbound traffic.

The final completion date for the improvements was on October 5, 2007 with a total cost of \$53,121.00.

### 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 September 1, 2007 to October 31, 2007. The before period consisted of reported crashes from November 1, 2003 through August 31, 2007 (3 years, 10 months) and the after period consisted of reported crashes from November 1, 2007 through August 31, 2011 (3 years, 10 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 on SR 1007 in the vicinity of the curve just northeast of SR 2505 (approximately MP 4.2 to 4.25). The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Ran Off Road crash types involving vehicles leaving the roadway on the north side were the target crashes for the guardrail insallation. The target crashes are clearly identified in the before and after period crash severity diagrams.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	15	1	-93.3
Total Severity Index	3.47	1	-71.2
Target Crashes	8	0	-100.0
Target Crash Severity Index	4.7	0	-100.0
Volume	3,700	2,300	-37.8
<b><u>Target Crash Severity Summary</u></b>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	2	0	-100.0
Class C Crashes	2	0	-100.0
PDO Crashes	4	0	-100.0

The naive before and after analysis at the treatment location resulted in a 93 percent decrease in total crashes, a 100 percent decrease in target crashes, and a 38 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

In the before period there were eight reported target crashes, including seven ran-off-road crashes involving eastbound vehicles losing control just after the curve and one head-on crash involving an eastbound vehicle sliding into the opposite lane, hitting a westbound vehicle, and then running off the road to the north and colliding with a tree.

In the after period there were no reported target crashes. It is typically expected that installation of guardrail will increase the frequency of ran-off-road crash types (due to the placement of an object on the road side) but lower the severity. On the December 2, 2011 field investigation there were no indications of collisions with the guardrail observed, although a small section towards the east end of the guardrail strip appears to have been replaced recently.

As noted in the *Project Background* section there were additional countermeasures implemented by the division prior to the guardrail installation, including shoulder repair work and warning signs. These countermeasures were installed approximately two years before the spot safety project was completed and likely contributed to the reduction in crashes from the before to the after period. However, there were two before period crashes, both target crashes, that occurred after these countermeasures were installed.

The calculated benefit to cost ratio for this project is 4.57 considering total crashes. The benefit to cost ratio considering only target crashes is 2.35. 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.

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 roadway.

**BENEFIT-COST ANALYSIS WORKSHEET - TOTAL**

LOCATION: SR 1007 approximately .1 miles east of SR 2505		BY: bdr						
COUNTY: Wake		DATE: 11/7/2011						
FILE NO.: SS 05-05-223								
DETAILED COST:	TYPE IMPROVEMENT -	shoulder guardrail						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
		\$53,121	10	0.149	\$7,917			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$53,121	10	0.149	\$7,917			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$7,917			
	TOTAL COST OF PROJECT=				\$53,121			
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	3.83	0	0.00	5	1.31	10	2.61	\$37,337
AFTER	3.83	0	0.00	0	0.00	1	0.26	\$1,123
						Annual Benefits from Crash Cost Savings		\$36,214
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$28,298		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	4.57		
TOTAL COST OF PROJECT		-	\$53,121	COMPREHENSIVE B/C RATIO		-	4.57	

**BENEFIT-COST ANALYSIS WORKSHEET - TARGET**

LOCATION: SR 1007 approximately .1 miles east of SR 2505		BY: bdr						
COUNTY: Wake		DATE: 11/7/2011						
FILE NO.: SS 05-05-223								
DETAILED COST:	TYPE IMPROVEMENT -	shoulder guardrail						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
		\$53,121	10	0.149	\$7,917			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$53,121	10	0.149	\$7,917			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$10,817			
	TOTAL COST OF PROJECT=				\$53,121			
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	3.83	0	0.00	4	1.04	4	1.04	\$25,379
AFTER	3.83	0	0.00	0	0.00	0	0.00	\$0
						Annual Benefits from Crash Cost Savings		\$25,379
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$14,562		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	2.35		
TOTAL COST OF PROJECT		-	\$53,121	COMPREHENSIVE B/C RATIO		-	2.35	

**Treatment Site Photos Taken December 2, 2011**



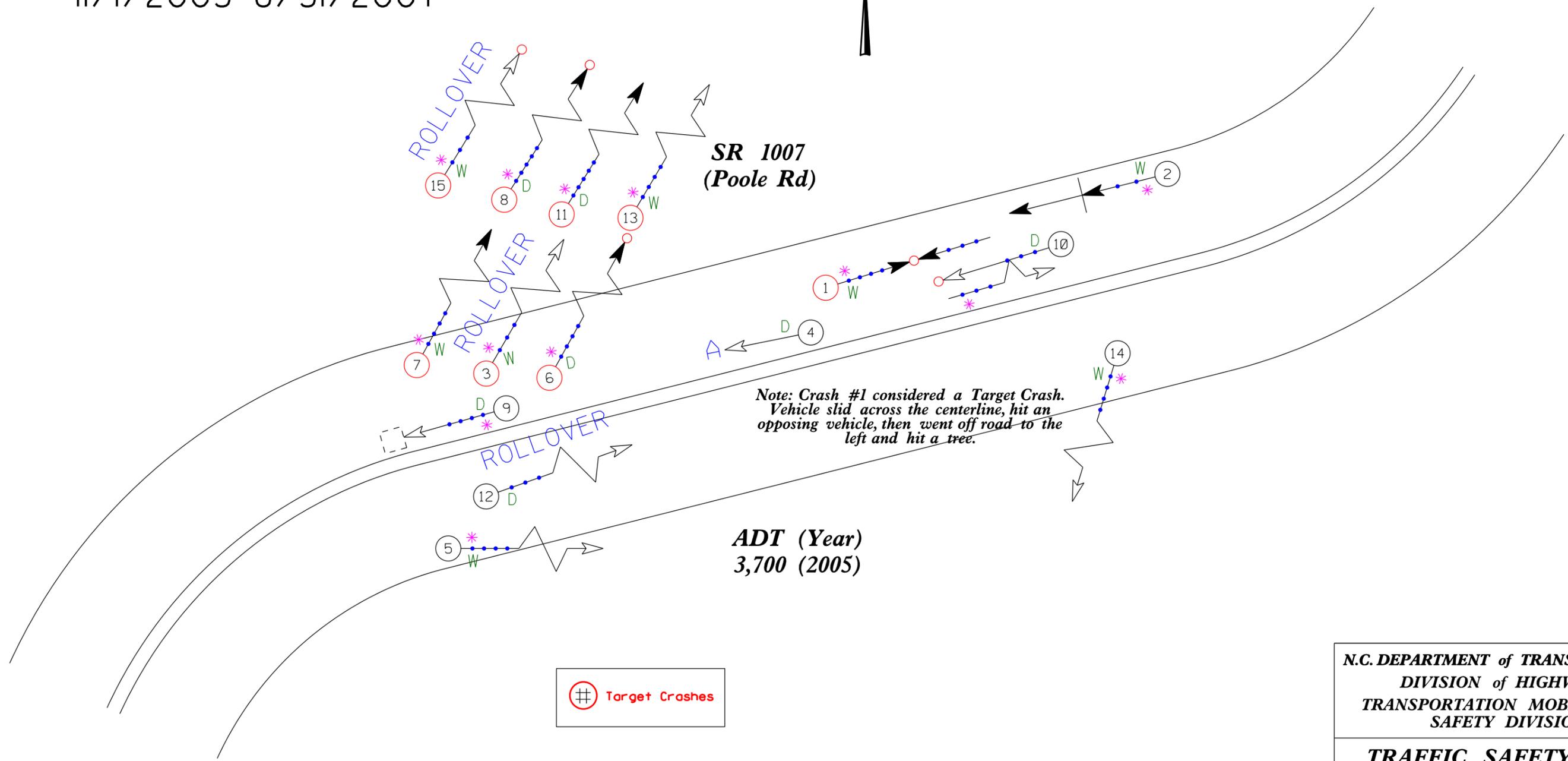
**Traveling eastbound on SR 1007**



**Traveling eastbound on SR 1007**

SS# 05-05-223  
 Order# 41000015600  
 Wake County  
 BEFORE Period  
 11/1/2003-8/31/2007

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
			PEDESTRIAN
			TRAIN
			DRIVER AT FAULT
			DRY
			WET
			ICY OR SNOWY
			ONLY



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

**TRAFFIC SAFETY UNIT**

Date: October 2011      Prepared By: bdr

SS# 05-05-223  
 Order# 41000015600  
 Wake County  
 AFTER Period  
 11/1/2007-8/31/2011

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		D DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W WET
	HEAD ON		INJURY		50 MPH TO 59		I ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		O OILY

SR 1007  
 (Poole Rd)

Guardrail

Tree

① D \*

ADT (Year)  
 2,300 (2009)

Target Crashes

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

TRAFFIC SAFETY UNIT

Date: October 2011

Prepared By: bdr