

Spot Safety Project Evaluation

Order # 41000012539

Spot Safety Project # 04-05-216

Spot Safety Project Evaluation of the Guardrail Installation in the Median on I-95 at the SR 1700 (Oak Level) Overpass Nash 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

8/12/2011

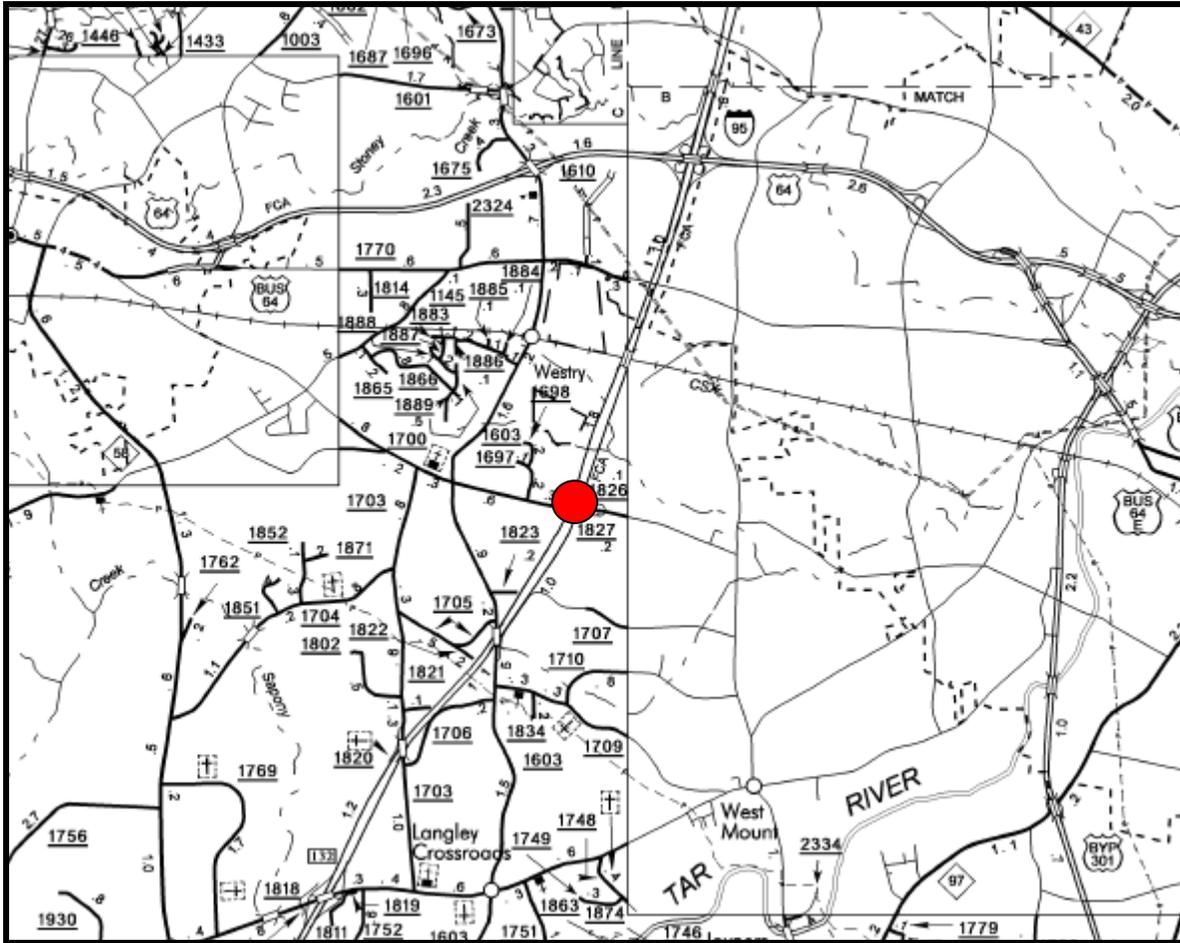
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-05-216 – North and southbound I-95 at the SR 1700 (Oak Level Rd) overpass in Nash County.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to install guardrail on north and southbound I-95 to shield the overpass piers located in the median.

I-95 is a four lane, two-way median divided interstate with a 70 mph speed limit. SR 1700 is a two lane, two-way roadway which crosses over I-95. The SR 1700 overpass is supported by six concrete piers which are located in the median.

The final completion date for the improvements was on November 27, 2007 with a total cost of \$21,000.00.

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 August 1, 2007 to November 30, 2007. The before period consisted of reported crashes from May 1, 2004 through July 31, 2007 (3 years, 3 months) and the after period consisted of reported crashes from December 1, 2007 through February 28, 2011 (3 years, 3 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 I-95 from 0.1 mile before to 200 feet after the SR 1700 overpass on each approach. 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 going into the median were the target crashes for the applied countermeasures. The target crashes are clearly identified in the before and after period crash severity diagrams.

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	3	2	-33.3
Total Severity Index	26.27	8.4	-68.0
Target Crashes	2	2	0.0
Target Crash Severity Index	38.90	8.4	-78.4
Volume	35,000	36,000	2.9
Target Crash Severity Summary			
Fatal Crashes	1	0	-100.0
Class A Crashes	0	0	N/A
Class B Crashes	0	1	N/A
Class C Crashes	0	1	N/A
PDO Crashes	1	0	-100.0

Results and Discussion

The naive before and after analysis at the treatment location resulted in a 33 percent decrease in total crashes, no change in target crashes, and a 78 percent decrease in the target crash severity index. The before period ADT year was 2004 and the after period ADT year was 2008.

The calculated benefit to cost ratio for this project is 56.63 considering total crashes. The benefit to cost ratio considering only target crashes is 56.22. 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.

In the before period there was a fatal target crash. It involved a southbound vehicle running off the road to the left and into a concrete pier. The crash occurred during wet road conditions, although no specific cause is given on the crash report.

It should be noted that a fatal crash occurred in the construction period that was not included in the analysis. On September 1, 2007 a southbound vehicle approaching the overpass ran off the road to the left, overcorrected, and then ran off the road to the right, colliding with the overpass support beam before coming to a stop. No guardrail was struck, although based on the crash report diagram it appears that the guardrail had already been installed.

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: I-95 at SR 1700 overpass		BY: bdr						
COUNTY: Nash		DATE: 8/11/2011						
FILE NO.: SS 04-05-216								
DETAILED COST:	TYPE IMPROVEMENT - Guardrail							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
	Right-of-Way	\$21,000	10	0.149	\$3,130			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$21,000	10	0.149	\$3,130			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$123			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$3,253			
	TOTAL COST OF PROJECT=				\$21,000			
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	3.25	1	0.31	0	0.00	2	0.62	\$196,492
AFTER	3.25	0	0.00	2	0.62	0	0.00	\$12,308
						Annual Benefits from Crash Cost Savings		\$184,185
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$180,932		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	56.63		
TOTAL COST OF PROJECT		-	\$21,000	COMPREHENSIVE B/C RATIO		-	56.63	

BENEFIT-COST ANALYSIS WORKSHEET - TARGET

LOCATION: I-95 at SR 1700 overpass		BY: bdr						
COUNTY: Nash		DATE: 8/11/2011						
FILE NO.: SS 04-05-216								
DETAILED COST:	TYPE IMPROVEMENT - Guardrail							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$0	0	0.000	\$0			
	Right-of-Way	\$21,000	10	0.149	\$3,130			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$21,000	10	0.149	\$3,130			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$123			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$3,253			
	TOTAL COST OF PROJECT=				\$21,000			
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	3.25	1	0.31	0	0.00	1	0.31	\$195,169
AFTER	3.25	0	0.00	2	0.62	0	0.00	\$12,308
						Annual Benefits from Crash Cost Savings		\$182,862
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$179,609		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	56.22		
TOTAL COST OF PROJECT		-	\$21,000	COMPREHENSIVE B/C RATIO		-	56.22	

Treatment Site Photos Taken March 25, 2011



Traveling on northbound I-95, approaching SR 1700 overpass



Traveling on northbound I-95, approaching SR 1700 overpass

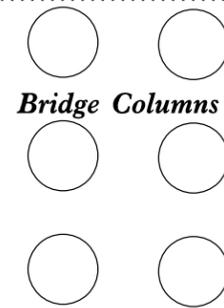


Traveling on southbound I-95, approaching SR 1700 overpass

SS# 04-05-216
 Order# 41000012539
 Nash County
 BEFORE Period
 5/1/04-7/31/07

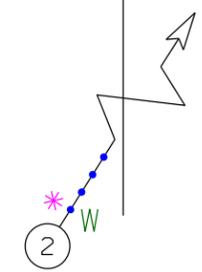
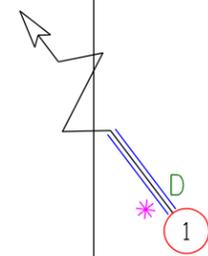
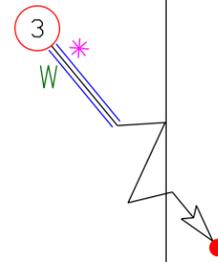
LEGEND			
	MOVING VEHICLE		ANGLE
	PEDESTRIAN		TURNING
	PARKED VEHICLE		BACKING
	PARKING VEHICLE		SIDESWIPE
	FIXED OBJECT		OUT OF CONTROL
	HEAD ON		INJURY
	REAR END		FATALITY
	RAN OFF ROAD		9 MPH OR LESS
			10 MPH TO 19
			20 MPH TO 29
			30 MPH TO 39
			40 MPH TO 49
			50 MPH TO 59
			60 MPH TO 69
	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

**SR 1700 Overpass
 (Oak Level Rd)**



I-95 Southbound Lanes

I-95 Northbound Lanes



Target Crashes



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

TRAFFIC SAFETY UNIT

Date: August 2011

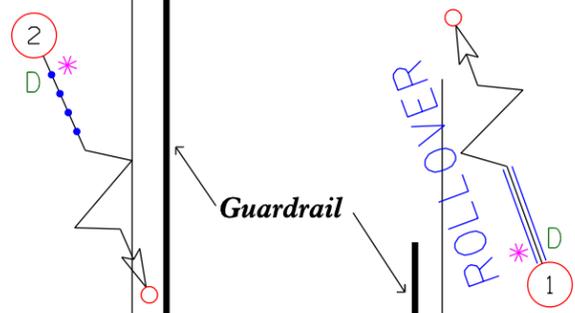
Prepared By: BDR

SS# 04-05-216
 Order# 41000012539
 Nash County
 AFTER Period
 12/1/07-2/28/11

**SR 1700
 (Oak Level)**

I-95 Southbound Lanes

I-95 Northbound Lanes



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



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

TRAFFIC SAFETY UNIT

Date: August 2011 Prepared By: BDR