

Spot Safety Project Evaluation

Project Log # 200906135

Spot Safety Project # 04-02-203

**Spot Safety Project Evaluation of the “Vehicle Entering When Flashing” Installation
SR 1330 (Raleigh Road) at SR 1356 (Woodall Dairy Road)
Johnston 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

7-27-2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-02-203 located at the Intersection of SR 1330 (Raleigh Road) and SR 1356 (Woodall Dairy Road) in Johnston County.

The Sig ID is 04-1257 for this newly installed flasher system.



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 “Vehicle Entering When Flashing” intersection flasher system. SR 1330 and SR 1356 are both two-lane facilities at the subject intersection with no turn lanes and speed limits of 55 mph on all approaches. The subject location is a three-leg intersection, which is controlled by a stop sign on SR 1356 (Woodall Dairy Rd). The fourth leg of this location is the entrance to the Martin Marietta Quarry.

The original statement of problem was the concern for collisions due to the restricted sight distance to the west of the intersection on SR 1330 which creates a danger due to the amount of trucks that potentially use this intersection. The entrance to the quarry was recently relocated to this location.

The initial crash analysis was completed from November 1, 1998 to October 31, 2002 with no crashes reported. The final completion date for the improvement at the subject intersection was on July 3, 2003 with a total cost of \$30,000.

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 months of June through July 2003. The before period consisted of reported crashes from September 1, 1997 through May 31, 2003 (5 years and 9 months); and the after period consisted of reported crashes from August 1, 2003 through April 30, 2009 (5 years and 9 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.

Treatment Information	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	2	3	50.0 %
Total Severity Index	4.70	5.93	26.2 %
Target Crashes	0	3	100+ %
Target Crash Severity Index	0.00	5.93	100+ %
Volume	2,800	3,200	14.3 %

<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	0	1	100.0 %
Class C Injury Crashes	1	1	0.0 %
Total Injury Crashes	1	2	100.0 %

The naive before and after analysis at the treatment location resulted in a 50 percent increase in Total Crashes, a 100+ percent increase in Target Crashes, and a 26 percent increase in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2006.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 50 percent increase in Total Crashes and a 100+ percent increase in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have increased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the before period did not consist of any frontal impact collisions. After the actuated flasher installation, one angle collision happened from a vehicle attempting to access the Quarry entrance and one left turn collision occurred at this location. One vehicle in both the before and the after period ran the stop control condition on SR 1356.

The calculated benefit to cost ratio for this project is **(-0.60) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-1.33)**. 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, provided by Google Street-View, are provided for all three 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



Looking South on SR 1330 (Raleigh Road) – Quarry entrance to left



Looking North on SR 1330 (Raleigh Road) – Quarry entrance to right



Looking East on SR 1356 (Woodall Dairy Road) – Quarry straight ahead



Looking into Quarry Entrance – Flasher on Stop Sign

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: SR 1330 at SR 1356		BY: JBS						
COUNTY: Johnston		DATE: 7/27/2009						
FILE NO.: SS 04-02-203		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - Vehicle When Entering Flasher							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$30,000	10	0.149	\$4,471				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$30,000	10	0.149	\$4,471				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$350				
TOTAL ANNUAL COST=				\$5,221				
TOTAL COST OF PROJECT=				\$30,000				
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	5.75	0	0.00	1	0.17	1	0.17	\$3,809
AFTER	5.75	0	0.00	2	0.35	1	0.17	\$6,939
Annual Benefits from Crash Cost Savings								(\$3,130)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$8,351)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-0.60		
TOTAL COST OF PROJECT		-	\$30,000	COMPREHENSIVE B/C RATIO		-	-0.60	

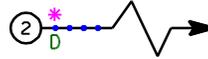
BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: SR 1330 at SR 1356		BY: JBS						
COUNTY: Johnston		DATE: 7/27/2009						
FILE NO.: SS 04-02-203		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT - Shoulder Guardrail							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$30,000	10	0.149	\$4,471				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$30,000	10	0.149	\$4,471				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$350				
TOTAL ANNUAL COST=				\$5,221				
TOTAL COST OF PROJECT=				\$30,000				
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	5.75	0	0.00	0	0.00	0	0.00	\$0
AFTER	5.75	0	0.00	2	0.35	1	0.17	\$6,939
Annual Benefits from Crash Cost Savings								(\$6,939)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$12,160)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-1.33		
TOTAL COST OF PROJECT		-	\$30,000	COMPREHENSIVE B/C RATIO		-	-1.33	



SR 1330
Raleigh Road
55 MPH

SR 1356
Woodall Dairy Rd
55 MPH



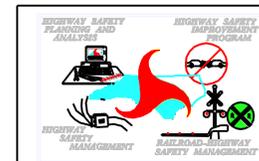
Martin Marietta
Quarry Entrance

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	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		HAZARD		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		70 AND UP		SPEED UNKNOWN
	RAN OFF ROAD				0 ONLY		

SS# 04-02-203
Johnston County
BEFORE Period
9/1/97 - 5/31/03

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION: 4	AREA:
STUDY PERIOD: 9/1/97 - 5/31/2003	
DISTANCE: Y-LINE + 150 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 7-10-2009	
LOG NUMBER: SS* 04-02-203 BEFORE	

Frontal Impact
Target Crashes

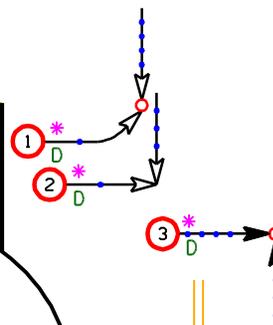
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION



SR 1330
Raleigh Road
55 MPH



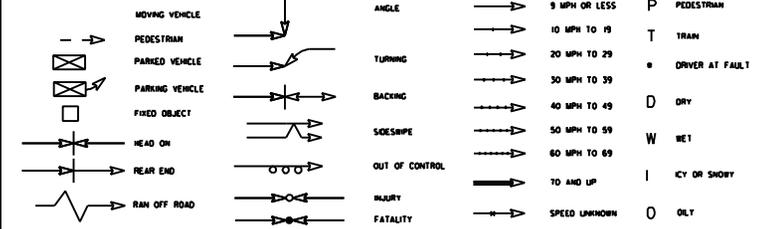
SR 1356
Woodall Dairy Rd
55 MPH



SR 1330
Approaches

Martin Marietta
Quarry Entrance

LEGEND



SS# 04-02-203
Johnston County
AFTER Period
8/1/03 - 4/30/09



Vehicle Entering
When Flashing

SR 1356 and
Quarry Approach



Frontal Impact
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION: 4	AREA:
STUDY PERIOD: 8/1/2003 - 4/30/2009	
DISTANCE: Y-LINE + 150 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: N/A	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 7-10-2009	
LOG NUMBER: SS* 04-02-203 AFTER	

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