

Spot Safety Project Evaluation

Project Log # 200812267

Spot Safety Project # 07-01-201

Spot Safety Project Evaluation of the Intersection Realignment At the Intersection of SR 1110 (Ellisboro Rd) and SR 1119 (Mt. Zion Loop Rd) Rockingham 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

4-21-2009

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-01-201 located at the Intersection of SR 1110 (Ellisboro Road) and SR 1119 (Mt. Zion Loop Road) in Rockingham County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the realignment of the intersection to 90 degrees and installation of a concrete median barrier. SR 1110 and SR 1119 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 1119 (Mt. Zion Loop Rd).

The original statement of problem was that motorists traveling northbound on SR 1110 were making high-speed left turns onto SR 1119 due to the significant skew angle which resulted in collisions with severe injuries. The purpose of this project was to alleviate the left turn accident pattern.

The initial crash analysis was completed from September 1, 1997 to August 31, 2000 with four (4) reported crashes, which were all deemed correctable. The four crashes resulted in one fatal, six class "A" injuries, and three class "B" injuries. The final completion date for the improvement at the subject intersection was on September 30, 2003 with a total cost of \$50,000.00.

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 June through September 2003. The before period consisted of reported crashes from May 1, 1998 through May 31, 2003 (5 years and 1 month); and the after period consisted of reported crashes from October 1, 2003 through October 31, 2008 (5 years and 1 month). 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 and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that SR 1110 Left Turn, Same Roadway Crashes were the target crashes for the applied countermeasure.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	2	2	0.0 %
Total Severity Index	42.60	4.70	- 89.0 %
Target Crashes	2	0	- 100.0 %
Target Crash Severity Index	42.60	0.00	- 100.0 %
Volume	3,200	4,100	28.1 %
<u>Injury Crash Summary</u>			
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	0	0	N/A
Class B injury Crashes	1	0	- 100.0 %
Class C Injury Crashes	0	1	100.0 %
Total Injury Crashes	2	1	- 50.0 %

The naive before and after analysis at the treatment location resulted in no change in Total Crashes but complete elimination of Target Crashes and an 89 percent decrease 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 100 percent decrease in Target Crashes and an 89 percent decrease in the Total Severity Index. The summary results above demonstrate that both Target Crashes and Severe Injury Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the two crashes at the intersection in the before period were the result of a vehicle turning left onto SR 1119 from SR 1110 at a high rate of speed. After the intersection realignment, this pattern was eliminated due to vehicles actually having to make the 90 degree turn around a concrete barrier. There were two after period crashes which both resulted from vehicles leaving the roadway in the curve on SR 1110 north of the intersection.

The calculated benefit to cost ratio for this project is **19.18 considering total crashes**. The benefit to cost ratio **considering only target crashes is 20.02**. 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 for all 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.

**SS# 07-01-201 Aerial Map
Rockingham County**



TREATMENT SITE PHOTOS TAKEN 1/26/2009



Traveling Southeast on SR 1119 (Mt. Zion Loop Road)



Traveling Southeast on SR 1119 – Realignment & New Median



Traveling North on SR 1110 (Ellisboro Road)



Traveling North on SR 1110 (Ellisboro Road) – New Alignment to the Left



Traveling South on SR 1110 (Ellisboro Road)



Traveling South on SR 1110 (Ellisboro Road) – New Alignment to the Right

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1110 at SR 1119
 COUNTY: Rockingham
 FILE NO.: SS 07-01-201

BY: JBS
 DATE: 4/14/2009
 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Intersection Realignment

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$50,000	20	0.102	\$5,093
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$50,000	20	0.102	\$5,093

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$5,093
 TOTAL COST OF PROJECT= \$50,000

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	5.08	1	0.20	1	0.20	0	0.00	\$101,969
AFTER	5.08	0	0.00	1	0.20	1	0.20	\$4,311

Annual Benefits from Crash Cost Savings \$97,657

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$92,565

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 19.18

TOTAL COST OF PROJECT - \$50,000 COMPREHENSIVE B/C RATIO - 19.18

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 110 at SR 1119
 COUNTY: Rockingham
 FILE NO.: SS 07-01-201

BY: JBS
 DATE: 4/14/2009
 NOTES: Target Crashes - SR 1110 Left Turn

DETAILED COST: TYPE IMPROVEMENT - Intersection Realignment

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$50,000	20	0.102	\$5,093
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$50,000	20	0.102	\$5,093

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$0
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$5,093
 TOTAL COST OF PROJECT= \$50,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

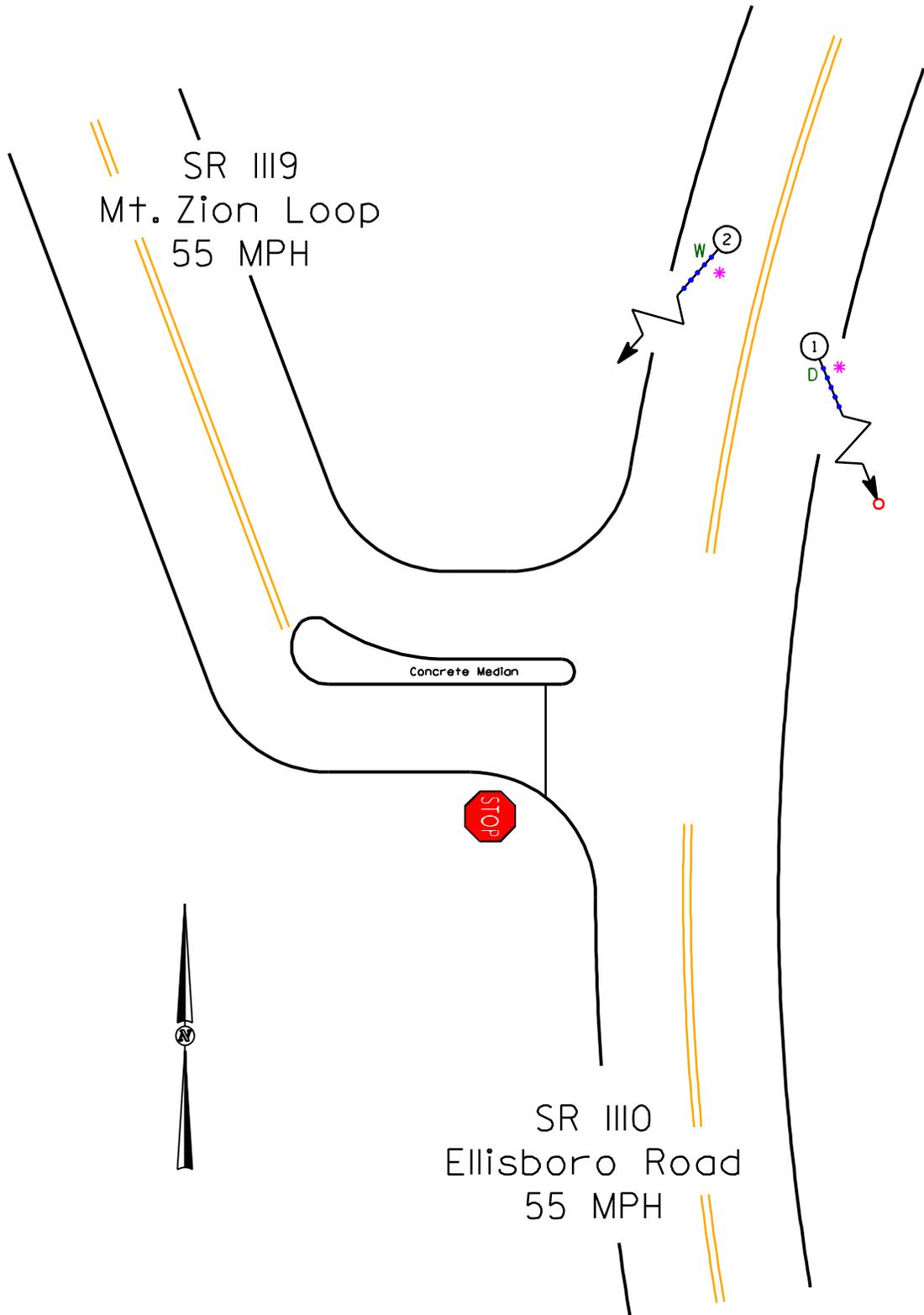
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.08	1	0.20	1	0.20	0	0.00	\$101,969
AFTER	5.08	0	0.00	0	0.00	0	0.00	\$0

Annual Benefits from Crash Cost Savings \$101,969

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$96,876

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 20.02

TOTAL COST OF PROJECT - \$50,000 COMPREHENSIVE B/C RATIO - 20.02



LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PAKED VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		HIT AND UP		50 MPH TO 59		ICY OR SNOW
	REAR END		HIT AND UP		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD		HIT AND UP		HIT AND UP		HIT AND UP
			HIT AND UP		HIT AND UP		HIT AND UP
			HIT AND UP		HIT AND UP		HIT AND UP
			HIT AND UP		HIT AND UP		HIT AND UP

SS# 07-01-201
Rockingham County
AFTER Period
10/1/03 - 10/31/08

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION: 7	AREA:
STUDY PERIOD: 10/1/2003 - 10/31/2008	
DISTANCE: Y-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 4-14-2009	
LOG NUMBER: SS* 07-01-201AFTER	

Target Crashes

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