

Spot Safety Project Evaluation

Order # 41000004042

Spot Safety Project # 10-03-201

**Spot Safety Project Evaluation of the Overhead Flasher Installation
SR 1514 (Rocky River Road) at SR 1520 (Indian Trail-Fairview Road)
Union 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

2-16-2010

Date

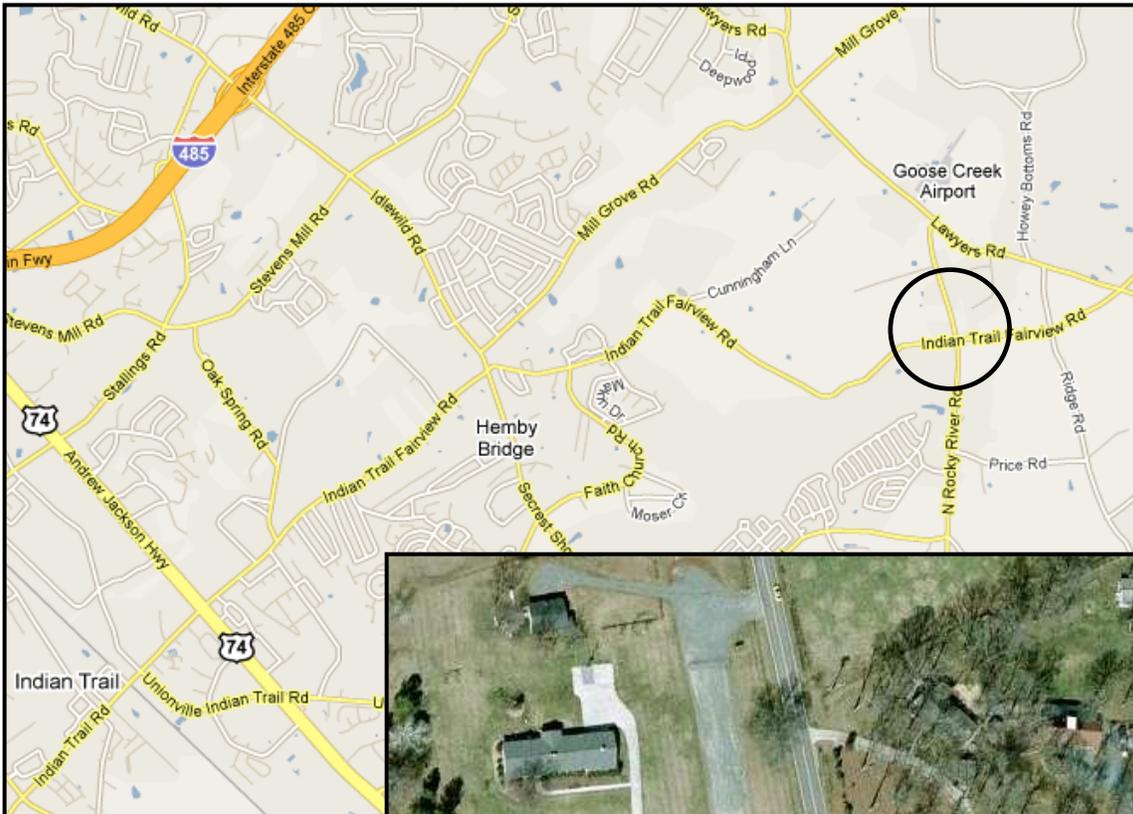
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-03-201 located at the Intersection of SR 1514 (Rocky River Road) and SR 1520 (Indian Trail-Fairview Road) in Union County.

The Sig ID is 10-1872 for this newly installed overhead flasher.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an overhead flasher unit. SR 1514 (Rocky River Rd) and SR 1520 are both two-lane facilities at the subject intersection with speed limits of 55 mph and 45 mph respectfully. The subject location is a four-leg crossroads intersection, which is controlled by a stop condition on the SR 1520 (Indian Trail-Fairview Rd) approaches.

The original statement of problem was that vehicles on SR 1520 were running the stop sign and having high speed impact collisions with opposing traffic. These collisions have resulted in three (3) fatalities and two (2) A-injuries. The intended purpose of the new flasher is to bring more awareness to the crossroad stop condition to prevent vehicles from running the stop signs.

The initial crash analysis was completed from January 14, 1999 to October 22, 2002 with nine (9) reported crashes, four (4) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on April 12, 2004 with a total cost of \$5,000.

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 were the months of March and April 2004. The before period consisted of reported crashes from August 1, 1998 through February 29, 2004 (5 years and 7 months); and the after period consisted of reported crashes from May 1, 2004 through November 30, 2009 (5 years and 7 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; U-turn; and Angle.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	13	24	84.6 %
Total Severity Index	23.05	8.48	- 61.8 %
Target Crashes – Frontal Impact	12	16	33.3 %
Target Crash Severity Index	24.88	11.75	- 52.8 %
Stop Sign Run Crashes	5	0	- 100.0 %
Volume	4,500	6,100	35.6 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	2	0	- 100.0 %
Class A injury Crashes	1	1	0.0 %
Class B injury Crashes	5	1	- 80.0 %
Class C Injury Crashes	3	13	300+ %
Total Injury Crashes	11	15	36.4 %

The naive before and after analysis at the treatment location resulted in an 85 percent increase in Total Crashes, a 33 percent increase in Target Crashes, yet a 62 percent decrease in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2007.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in an 85 percent increase in Total Crashes and a 33 percent increase in Target Crashes. The summary results above demonstrate that both Total 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 intersection was experiencing a repeated occurrence of angle collisions. These angle collisions were comprised of five (5) stop sign run crashes resulting in two (2) fatality crashes and seven (7) other insufficient gap collisions by SR 1520 motorists. With the installation of the overhead flasher, no vehicles ran the stop sign in the after period. This accomplished the intended goal which reduced the severity of the intersection collisions; therefore giving this analysis a significant benefit-cost ratio.

However, crash patterns at this location increased during the after period. Insufficient gap angle collisions increased from seven (7) to twelve (12). There were also four (4) more other frontal impact collisions. Rear-end crashes on SR 1514 (Rocky River Rd) also established from zero (0) in the before period to three (3) in the after period.

The calculated benefit to cost ratio for this project is **111.07 considering total crashes**. The benefit to cost ratio **considering only target crashes is 116.39**. 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 from Google Street View for all four 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



Traveling South on SR 1514 (Rocky River Rd)



Traveling North on SR 1514



Looking East on SR 1520 (Indian Trail-Fairview Road)



Looking West on SR 1520

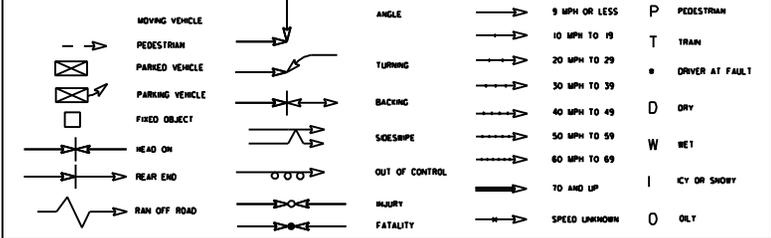
BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: SR 1514 at SR 1520		BY: JBS						
COUNTY: Union		DATE: 2/10/2010						
FILE NO.: SS 10-03-201		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT -	Overhead Flasher						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$5,000	10	0.149	\$745			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$5,000	10	0.149	\$745			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$300			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$350			
	TOTAL ANNUAL COST=				\$1,395			
	TOTAL COST OF PROJECT=				\$5,000			
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	5.58	3	0.54	8	1.43	2	0.36	\$296,022
AFTER	5.58	1	0.18	14	2.51	9	1.61	\$141,057
						Annual Benefits from Crash Cost Savings		\$154,964
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$153,569		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	111.07		
	TOTAL COST OF PROJECT	-	\$5,000	COMPREHENSIVE B/C RATIO	-			111.07

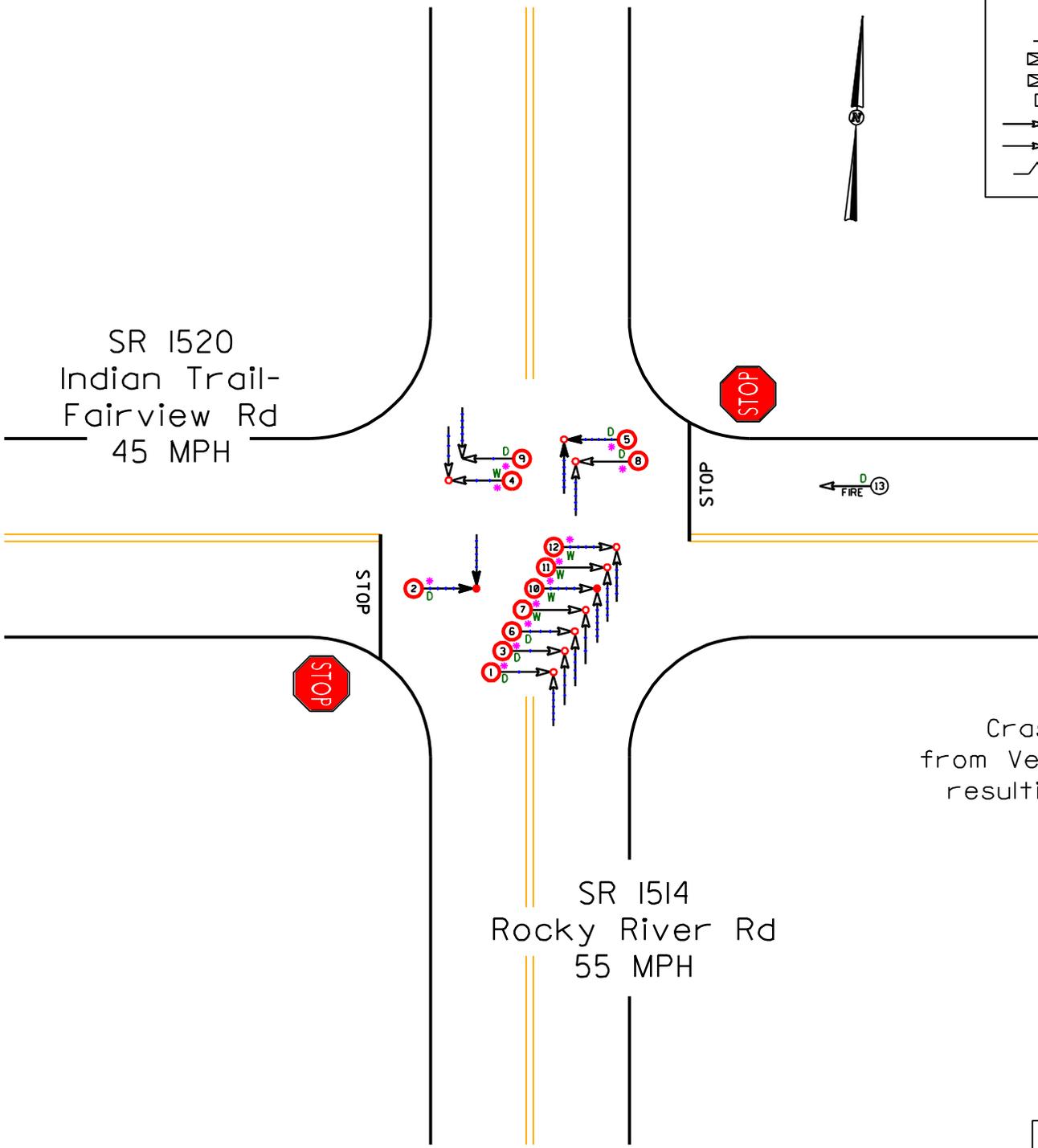
BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: SR 1514 at SR 1520		BY: JBS						
COUNTY: Union		DATE: 2/10/2010						
FILE NO.: SS 10-03-201		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT -	Overhead Flasher						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$5,000	10	0.149	\$745			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$5,000	10	0.149	\$745			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$300			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$350			
	TOTAL ANNUAL COST=				\$1,395			
	TOTAL COST OF PROJECT=				\$5,000			
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	5.58	3	0.54	8	1.43	1	0.18	\$295,323
AFTER	5.58	1	0.18	13	2.33	2	0.36	\$132,939
						Annual Benefits from Crash Cost Savings		\$162,384
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=	\$160,988		
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=	116.39		
	TOTAL COST OF PROJECT	-	\$5,000	COMPREHENSIVE B/C RATIO	-			116.39

LEGEND



SS# 10-03-201
 Union County
 BEFORE Period
 8/1/98 - 2/29/04



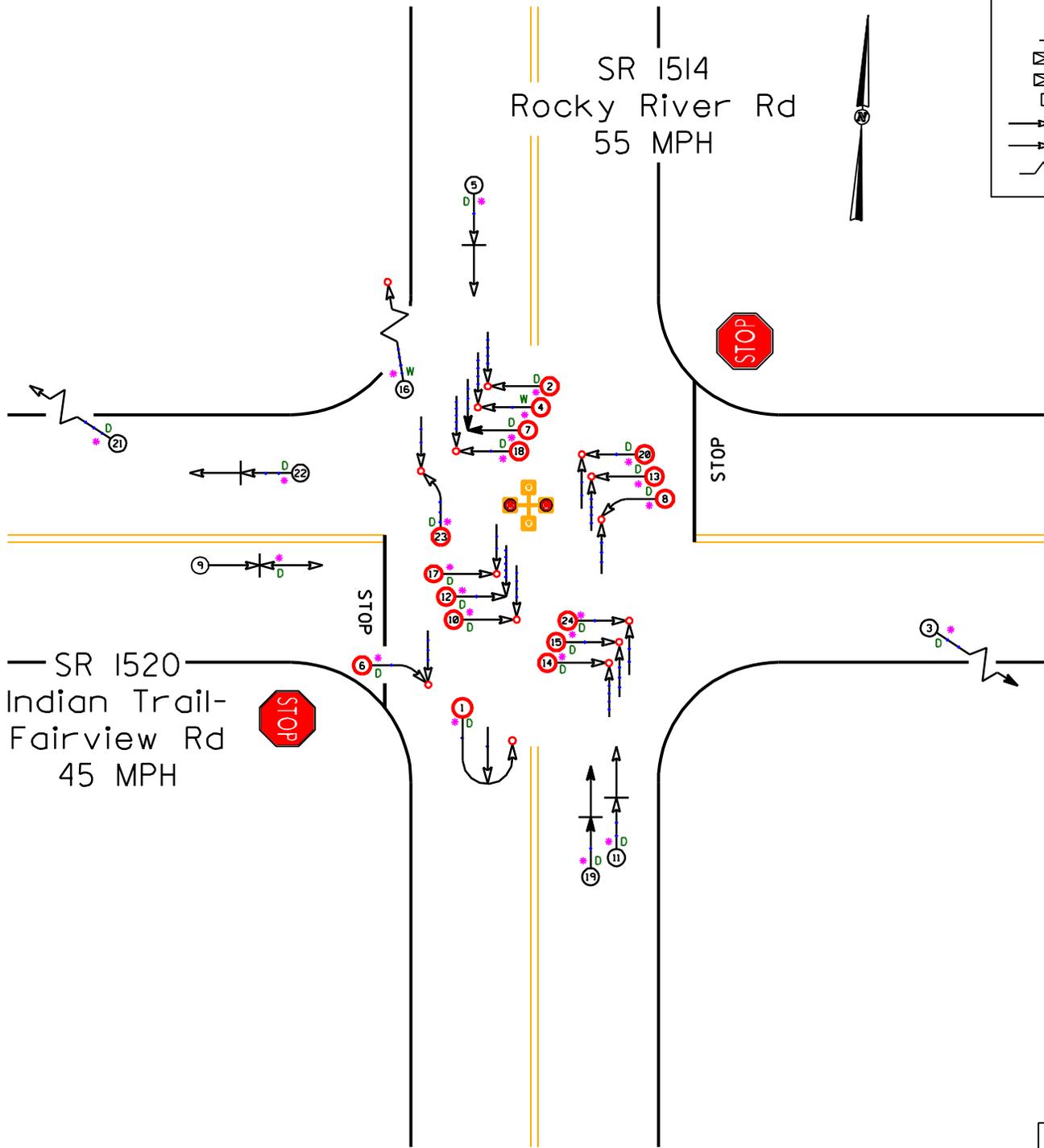
Crashes 2, 5, 6, 10, 12 resulted from Vehicles running the stop sign; resulting in Two Fatality Crashes

⊕ Frontal Impact Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION ID	AREA
STUDY PERIOD: 8/1/98 - 2/29/2004		
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: 2-9-2010		
LOG NUMBER: SS* 10-03-201 BEFORE		

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



LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	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		HURT		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		60 MPH TO 69		TO AND UP
	RAN OFF ROAD		SPEED UNKNOWN		70 MPH TO 79		ONLY

SS# 10-03-201
 Union County
 AFTER Period
 5/1/04 - 11/30/09



New Overhead
 Flasher Assembly
 Sig ID: 10-1872

Note: No vehicles
 ran the stop sign in
 the after period.

Frontal Impact
 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION ID	AREA
	STUDY PERIOD: 5/1/2004 - 2/29/2004	
	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: 2-10-2009		
LOG NUMBER: SS* 10-03-201 AFTER		

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