

Spot Safety Project Evaluation

Order # 41000009103

Spot Safety Project # 08-01-003

**Spot Safety Project Evaluation of the
Northbound Left and Right Turn Lane Extensions
US 1-15-501 at NC 78 / SR 1303
Lee 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

11-15-2010

Date

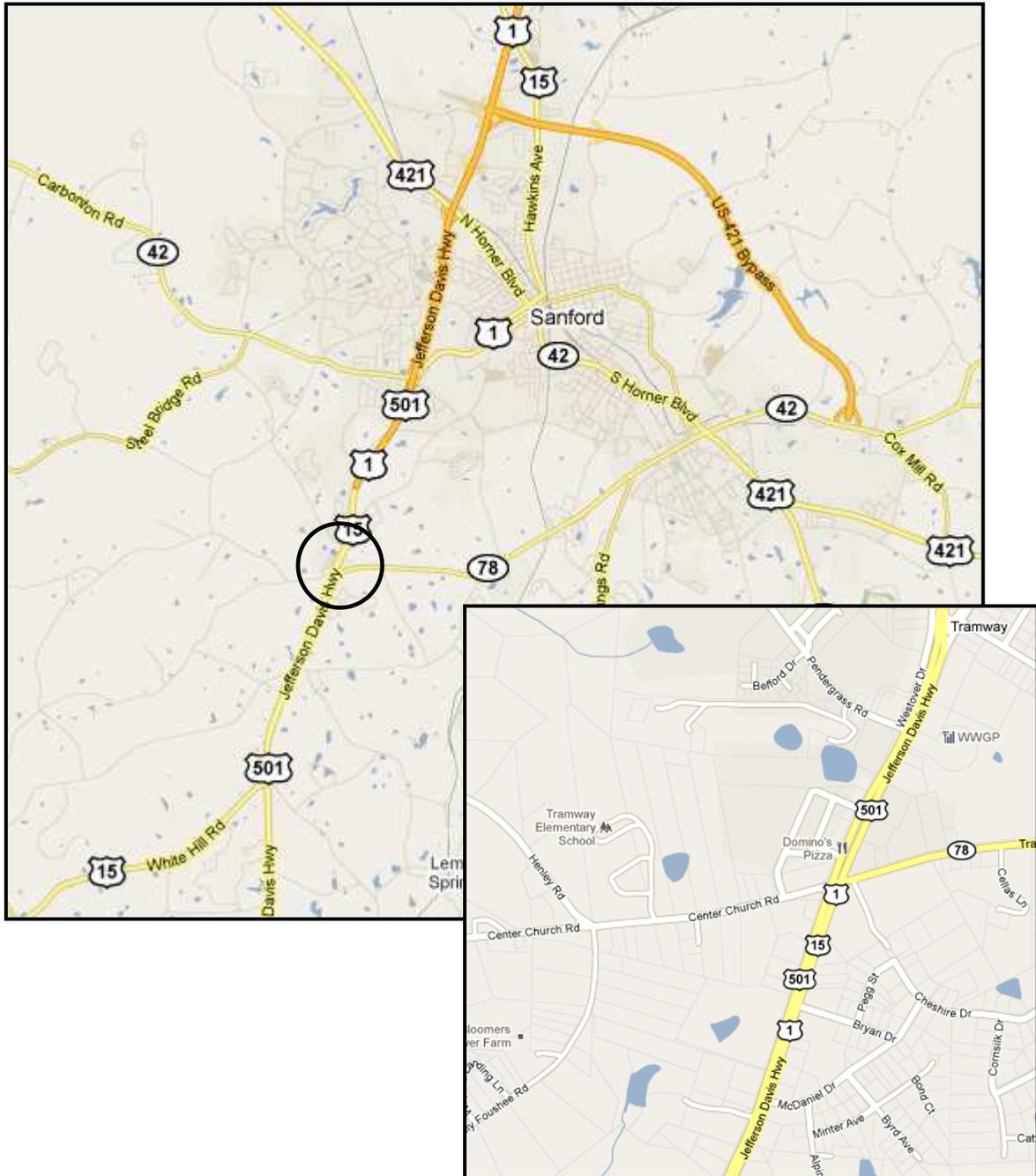
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-01-003 located at the Intersection of US 1-15-501 (Jefferson Davis Highway) at NC 78 (Tramway Rd) / SR 1303 (Center Church Road) in Lee County, Community of Tramway and south of the City of Sanford.

The Sig ID is 08-0106 for this existing traffic signal.





Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the extension of the northbound left and right turn lanes on US 1-15-501. The left turn lane was extended from a 150' full storage in the before period to 400' full storage in the after period. US 1-15-501 (Jefferson Davis Highway) is a four-lane median divided facility with a 45 mph speed limit. NC 78 (Tramway Rd) and SR 1303 (Center Church Rd) are both two-lane facilities that widen to provide left turn lanes at the subject intersection with speed limits of 55 and 45 mph respectively. The subject location is a four-leg crossroads intersection, which is controlled by an existing traffic signal.

The original statement of problem was the existence of northbound US 1-15-501 left turning vehicles queuing past the turn lane and blocking the through movement approaching the signal. This improvement was designed around increasing capacity for the northbound approach and preventing additional crashes due to queuing vehicles.

The initial crash analysis was completed from December 31, 1997 to December 31, 2000 with twenty-four (24) reported intersection crashes. The final completion date for the improvement at the subject intersection was on June 30, 2006 with a total cost of \$75,000.

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 May through July 2006. The before period consisted of reported crashes from April 1, 2002 through April 30, 2006 (4 years and 1 month); and the after period consisted of reported crashes from August 1, 2006 through August 31, 2010 (4 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 for the eastbound SR 1303 approach, westbound NC 78 approach, and southbound approach of US 1-15-501 to the subject intersection. A y-line of 500 feet was selected for the northbound US 1-15-501 approach to encompass the entire turn lane extension. *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 all crashes on the northbound approach to the intersection traffic signal were the target crashes for the applied countermeasure. The northbound approach crash types included are as follows: Rear-end, Slow or Stop; Right turn, different roadways; and Sideswipe, Same Direction.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	43	42	- 2.3 %
Total Severity Index	4.27	5.45	27.6 %
Target Crashes – Northbound Approach	17	8	- 52.9 %
Target Crash Severity Index	4.05	6.55	61.7 %
Volume (2004, 2008)	38,200	35,800	- 6.3 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	1	100.0 %
Class B injury Crashes	1	2	100.0 %
Class C Injury Crashes	18	13	- 27.8 %
Total Injury Crashes	19	16	- 15.8 %

The naive before and after analysis at the treatment location resulted in a 2 percent decrease in Total Crashes, a 53 percent decrease in Target Crashes, but a 28 percent increase in the Total Severity Index. The before period ADT year was 2004 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams*, the northbound US 1-15-501 approach (leading up to the signal) experienced a crash reduction of 53 percent from the before to the after periods. The reduction per crash type include: rear-end (13 to 7), sideswipe (3 to 0), and right turn (1 to 0). There was one (1) additional backing-up collision in the after period. The additional left and right turn storage capacity does appear to have benefited the crash history of this particular intersection approach.

However, overall the intersection has remained consistent with the total number of collisions. There was also one (1) A-injury crash in the after period which gave the total project a negative benefit-cost ratio with an increase in the severity index. Frontal impact crashes in the intersection increased slightly from nine (9) in the before period to ten (10) in the after period. Southbound US 1-15-501 approach collisions, rear-ends and sideswipes, also increased from ten (10) to thirteen (13) through the analysis.

The calculated benefit to cost ratio for this project is **(-11.83) considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.15**. 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 North on US 1-15-501 showing turn lane extensions



Traveling North on US 1-15-501 at traffic signal



Traveling South on US 1-15-501 (Jefferson Davis Highway)



Traveling East on SR 1303 (Center Church Road)



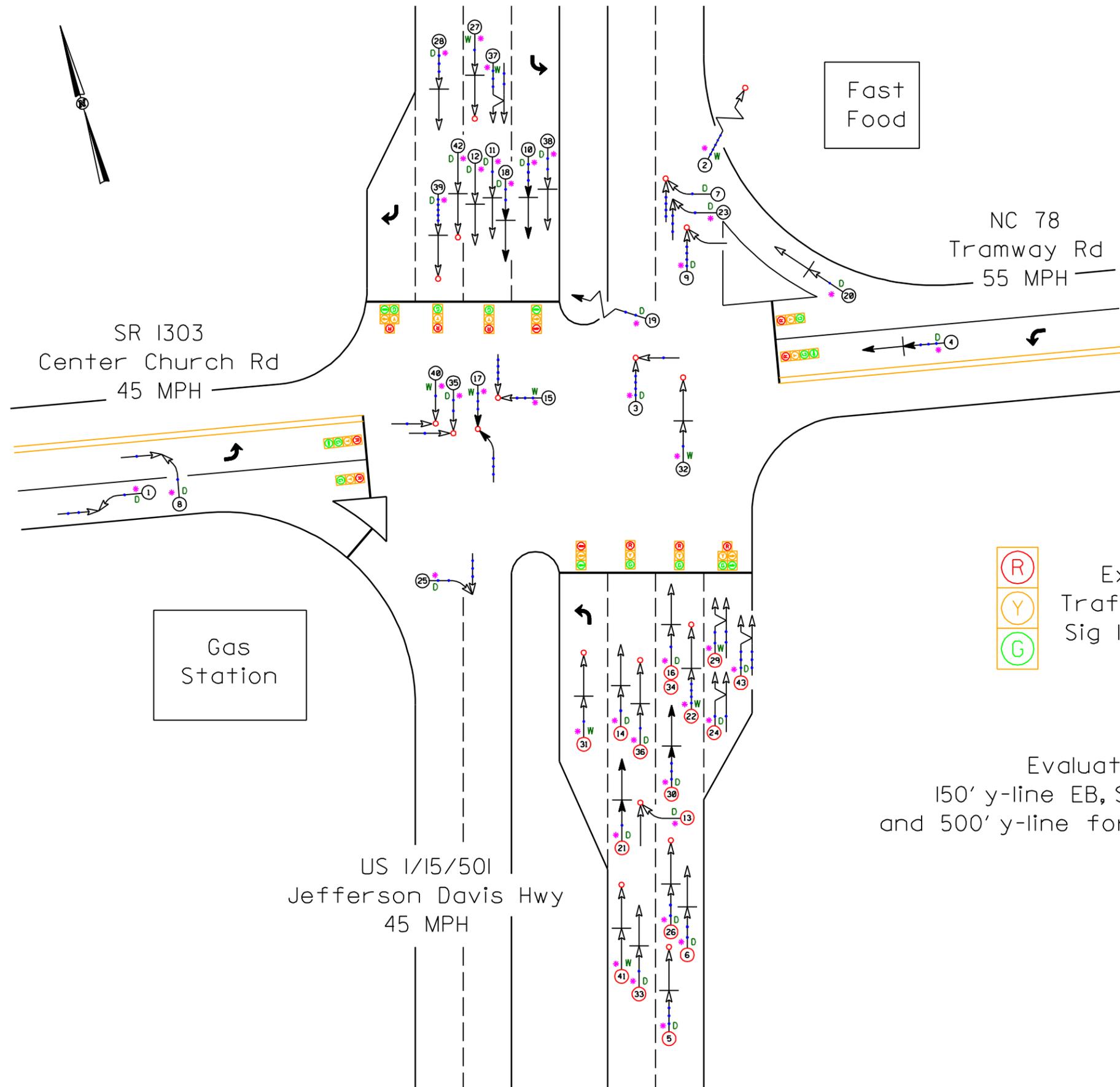
Looking West on NC 78 (Tramway Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US 1-15-501 at NC 78 / SR 1303		BY: JBS						
COUNTY: Lee		DATE: 11/12/2010						
FILE NO.: SS 08-01-003								
DETAILED COST:	TYPE IMPROVEMENT - Extend NB Left and Right Turn Lanes							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$75,000	10	0.149	\$11,177				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$75,000	10	0.149	\$11,177				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
TOTAL ANNUAL COST=				\$11,577				
TOTAL COST OF PROJECT=				\$75,000				
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	4.08	0	0.00	19	4.66	24	5.88	\$118,431
AFTER	4.08	1	0.25	15	3.68	26	6.37	\$255,343
Annual Benefits from Crash Cost Savings								(\$136,912)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						= (\$148,489)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						= -11.83		
TOTAL COST OF PROJECT		-	\$75,000	COMPREHENSIVE B/C RATIO		-	-11.83	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: US 1-15-501 at NC 78 / SR 1303		BY: JBS						
COUNTY: Lee		DATE: 11/12/2010						
FILE NO.: SS 08-01-003								
DETAILED COST:	TYPE IMPROVEMENT - Extend NB Left and Right Turn Lanes							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$75,000	10	0.149	\$11,177				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$75,000	10	0.149	\$11,177				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0				
TOTAL ANNUAL COST=				\$11,577				
TOTAL COST OF PROJECT=				\$75,000				
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	4.08	0	0.00	7	1.72	10	2.45	\$44,853
AFTER	4.08	0	0.00	6	1.47	2	0.49	\$31,520
Annual Benefits from Crash Cost Savings								\$13,333
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST						= \$1,756		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST						= 1.15		
TOTAL COST OF PROJECT		-	\$75,000	COMPREHENSIVE B/C RATIO		-	1.15	



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		ONLY
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		

SS# 08-01-003
 Order# 41000009103
 Lee County
 BEFORE Period
 4/1/02 - 4/30/06

Existing
 Traffic Signal
 Sig ID 08-0106

Evaluation based on
 150' y-line EB, SB, & WB approaches
 and 500' y-line for Northbound US 1/15/501

NB Approach
 Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 11-10-2010

Prepared By: J. Schronce



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		ONLY
	RAN OFF ROAD				70 AND UP		
					SPEED UNKNOWN		

SS# 08-01-003
 Order# 41000009103
 Lee County
 AFTER Period
 8/1/06 - 8/31/10

Existing
 Traffic Signal
 Sig ID 08-0106

Evaluation based on
 150' y-line EB, SB, & WB approaches
 and 500' y-line for Northbound US 1/15/501

Countermeasure:
 Extend NB Left and Right
 Turn Lanes

NB Approach
 Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 11-10-2010 Prepared By: J. Schronce

