

Spot Safety Project Evaluation

Project Log # 200702025

Spot Safety Project # 04-01-255

Spot Safety Project Evaluation of the Installation of Left Turn Lanes and Signal Revisions to allow protected left turns at SR 1711 (Oak Forest Road) and US 70 Wayne County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

Jason B. Schronce

5-3-2007
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-01-255 – US 70 at SR 1711 (Oak Forest Road) in Wayne County, near Goldsboro.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the revision of signal phasing to include a protected left turn from SR 1711 and the concrete median removal to install left turn lanes on the approaches of SR 1711.

US-70 is a 4 lane divided facility with a 55-mph speed limit. US 70 also provides right and left turn lanes on both approaches to the intersection. SR 1711 is a 2 lane 2 way facility with a 45-mph speed limit. Traffic control is provided by a 5 phase fully actuated (isolated) signal; number 04-0628.

The location also has Advance Signal Warning signs and each approach has an advanced signal head for better visibility of the signal.

The initial statement of problem was the current lane assignments on SR 1711 create confusion for motorists attempting to determine who is turning left and who is going straight. The overall improvement will provide a safer turning movement for motorists from SR 1711 onto US-70 and alleviate crashes.

The initial crash analysis was conducted from January 1, 1998 to December 31, 2000, which included 23 crashes. Through this improvement project, 8 of these crashes were determined as correctable left turn collisions that resulted in 5 “C” class injuries.

The final completion date for the improvement at the subject intersection was on December 2, 2002 with a total cost of \$20,000.

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 from October 1, 2002 through January 31, 2003. The before period consisted of reported crashes from December 1, 1998 through September 30, 2002 (3 years, 10 months) and the after period consisted of reported crashes from February 1, 2003 through November 30, 2006 (3 years, 10 months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The treatment data consisted of all crashes on US 70 and SR 1711 located within 150 feet of the intersection, which included the intersections of SR 1711 at McClain Drive and Commercial Drive.

These service roadways run parallel to US 70. *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 Left Turn, Same Roadway Crashes on SR 1711, were the target crashes for the applied countermeasure.

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	25	26	4.00 %
Total Severity Index	9.73	4.70	- 51.69 %
Target Crashes	5	1	- 80.00 %
Target Crashes Severity Index	3.96	1.00	- 74.75 %
Volume	32,600	32,400	- 0.61 %

Injury Crash Summary		
	Before	After
Fatal Crashes	0	0
Class A Crashes	2	0
Class B Crashes	3	3
Class C Crashes	6	10
Total Injury Crashes	11	13

The naive before and after analysis at the treatment location resulted in a 4 percent increase in Total Crashes, an 80 percent decrease in Target Crashes, and a very small percent decrease in Average Daily Traffic (ADT). The before period ADT year was 2000 and the after period ADT year was 2004.

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 4 percent increase in Total Crashes and an 80 percent decrease in Target Crashes, while the ADT slightly decreased. The total severity index decreased 52 percent while the target crash severity index decreased 75 percent. The summary results above demonstrate that the treatment location appears to have successfully decreased Target Crashes and severity from the before to the after period.

The countermeasure installed was successful in eliminating the left turn, same roadway collisions on SR 1711. The one after period target crash involved a tractor-trailer that turned “right on red” and struck a left turning vehicle from SR 1711 onto US 70.

A pattern of rear-end crashes noticeably developed on the eastbound US 70 approach when comparing the before and after period collision diagrams. Rear-end crashes increased from 3 to 9 on the eastbound approach and remained constant on the westbound approach (9 to 9).

This signal is also the first non-controlled access intersection traveling east on US 70 for a considerable distance. Drivers may not be use to signal intersection control since they have been traveling through a full control section of roadway for the last couple miles therefore contributing to the eastbound rear-end crash pattern development.

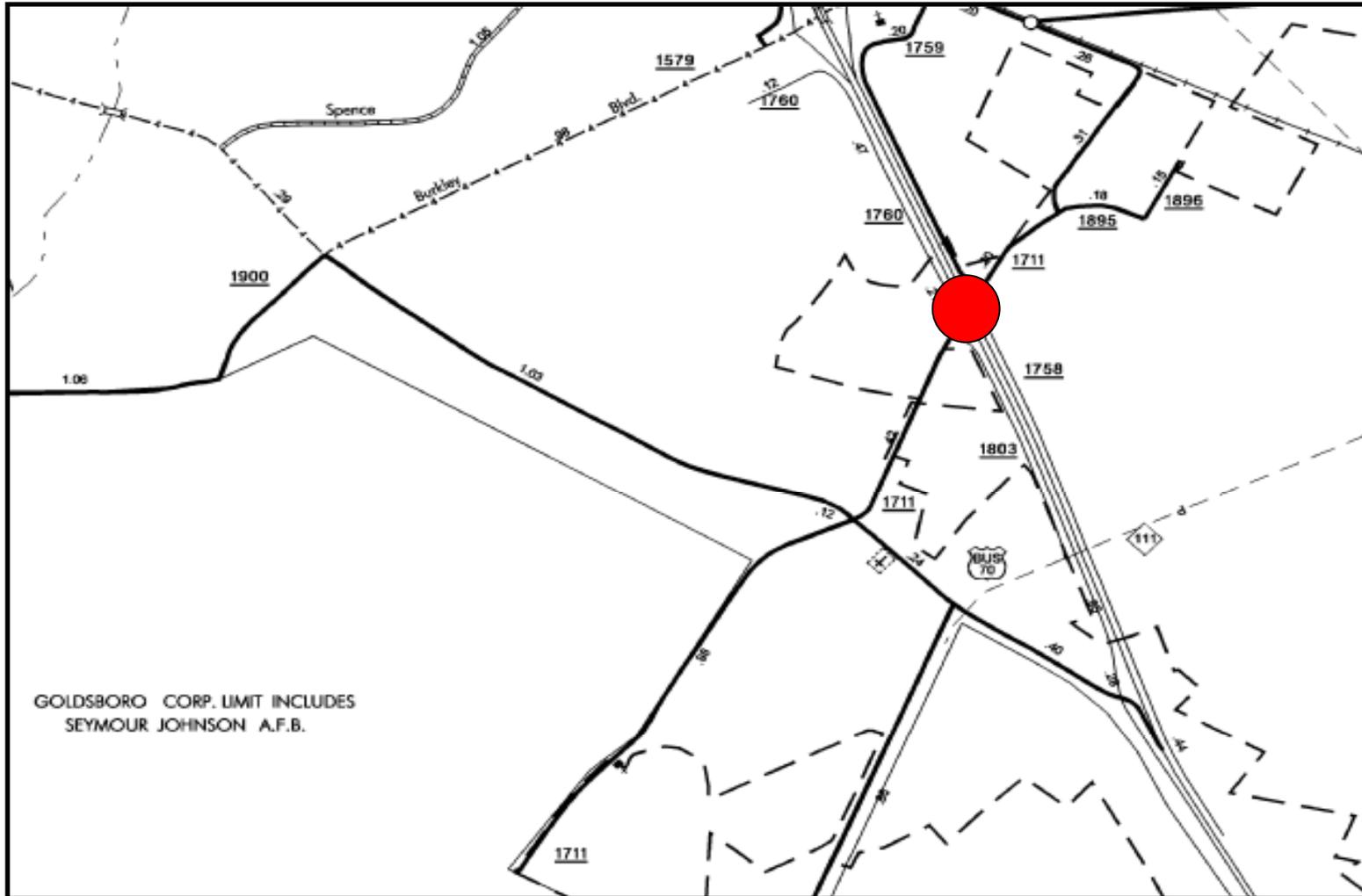
For additional information, Spot Safety Project number 04-05-208 was completed at this intersection on February 15, 2007 which included the installation of “Prepare To Stop” signs with yellow light activated flashers on the US 70 approaches. During the field visit to this location, we observed posted dual flashers on both sides of each US 70 approach. The Safety Evaluation group plans to monitor the effectiveness of this countermeasure over the next year for quantification of its effort to reduce rear-end crashes on US 70. The rear-end crash pattern in the eastbound direction developed in the after period of this study and can be seen on the *Collision Diagram*. File information for Spot Safety Project 04-05-208 recommended the countermeasure due to the change from a freeway section to signalized intersection control and motorists running the red indication signal.

The calculated benefit to cost ratio for this project is 94.05 considering total crashes. The benefit to cost ratio considering only target crashes is 4.42. 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. The large differential in total and target benefits came from the crash costs associated with 2 K-A non-target crashes in the before period.

Please see the attached *Treatment Site Photos*. Photos are provided for all four approaches to the subject location including a picture of the newly installed “Prepare To Stop” flashers.

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.

**Location Map
Wayne County
Evaluation of Spot Safety Project # 04-01-255**



**Location: US 70 / NC 111 at SR 1711 (Oak Forest Road)
Near Goldsboro, NC**

TREATMENT SITE PHOTOS TAKEN 4/12/2007



Traveling East on US-70 – notice the closeness of the dual advance warning signs to the intersection.



Traveling West on US-70



Traveling North on SR 1711 (Oak Forest Rd)



Traveling North on SR 1711 (Oak Forest Rd)



Traveling South on SR 1711



Traveling South on SR 1711 – Notice service roads in proximity to the intersection



Dual Posted Advance Warning Signs – located on both sides of US-70 on the Eastbound and Westbound approaches – installed on 2/15/2007

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 70 at SR 1711 (Oak Forest)
 COUNTY: Wayne
 FILE NO.: SS 04-01-255

BY: JBS
 DATE: 3/14/2007
 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes on SR 1711 and Add Protective Left Turns onto US 70

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$20,000	20	0.102	\$2,037
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$20,000	20	0.102	\$2,037

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$400
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$150
 TOTAL ANNUAL COST= \$2,587
 TOTAL COST OF PROJECT= \$20,000

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	3.83	2	0.52	9	2.35	14	3.66	\$317,650
AFTER	3.83	0	0.00	13	3.39	13	3.39	\$74,334

Annual Benefits from Crash Cost Savings \$243,316

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$240,729
 BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 94.05

TOTAL COST OF PROJECT - \$20,000 COMPREHENSIVE B/C RATIO - 94.05

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 70 at SR 1711 (Oak Forest)
 COUNTY: Wayne
 FILE NO.: SS 04-01-255

BY: JBS
 DATE: 3/14/2007
 NOTES: Target Crashes Only

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes on SR 1711 and Add Protective Left Turns onto US 70

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$20,000	20	0.102	\$2,037
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$20,000	20	0.102	\$2,037

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$400
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 TOTAL ANNUAL COST= \$2,587
 TOTAL COST OF PROJECT= \$20,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	3.83	0	0.00	2	0.52	3	0.78	\$12,454
AFTER	3.83	0	0.00	0	0.00	1	0.26	\$1,018

Annual Benefits from Crash Cost Savings \$11,436

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$8,849

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 4.42

TOTAL COST OF PROJECT - \$20,000 COMPREHENSIVE B/C RATIO - 4.42

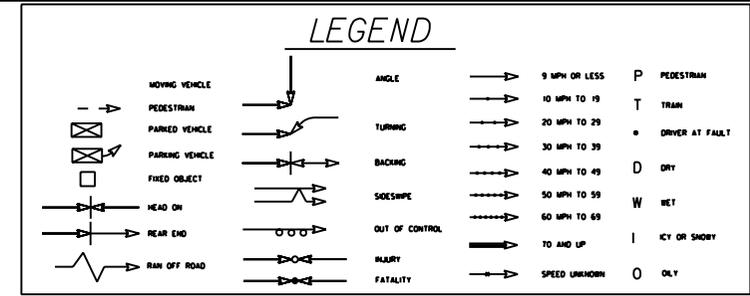
US 70 / NC III
55 MPH

Commercial Drive

McClain Drive

SR 1711
Oak Forest Road
45 MPH

SS# 04-01-255
Wayne County
BEFORE PERIOD
12/1/98 - 9/30/02
US 70 at SR 1711

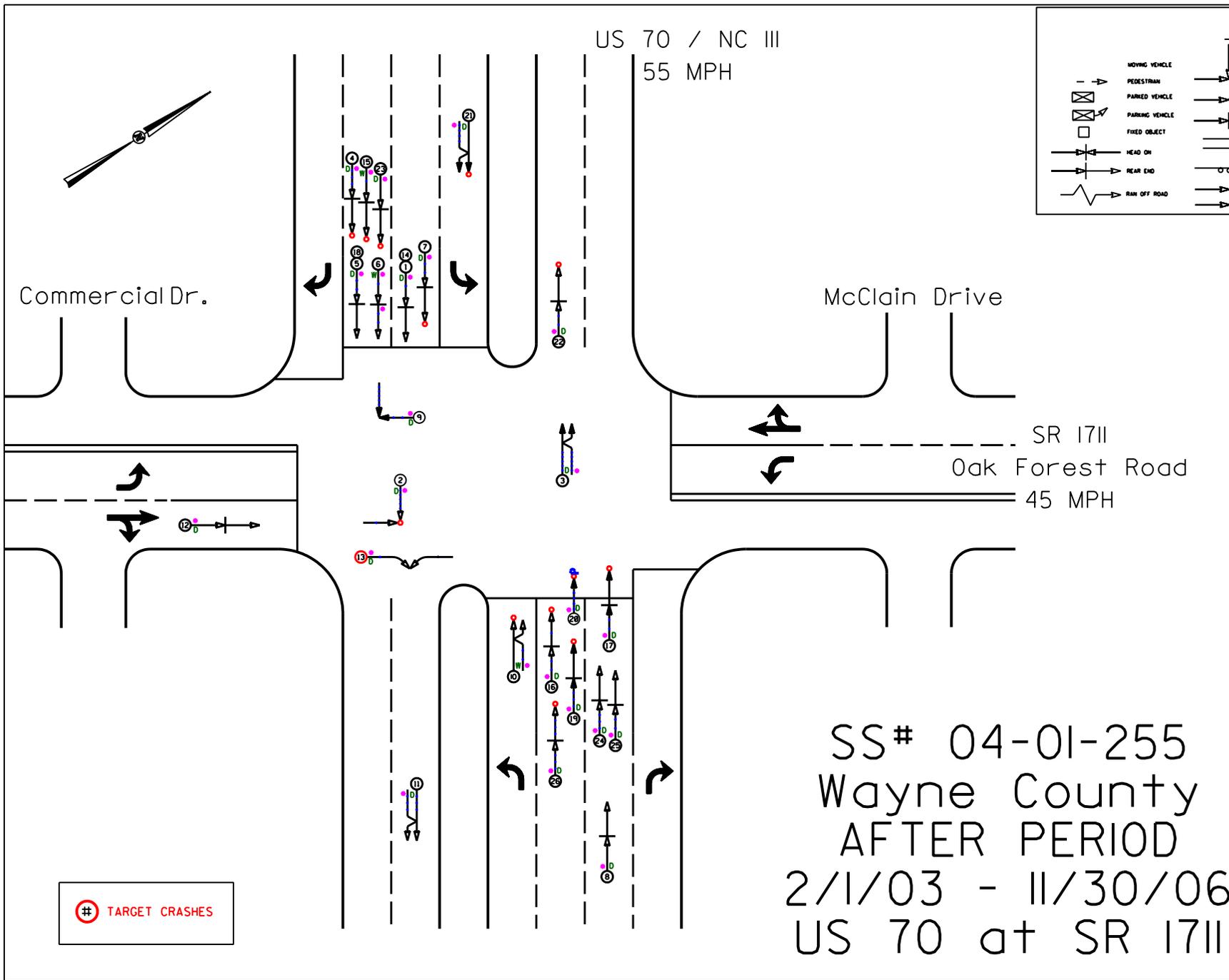


TARGET CRASHES

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

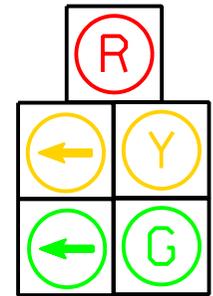
	COLLISION DIAGRAM	
	DIVISION: 4	AREA:
	STUDY PERIOD: 12/1/98 TO 9/30/02	DISTANCE: 1-LINE = 150 FT
	ANALYSIS PREPARED BY: JBS	DIAGRAM PREPARED BY: JBS
	ANALYSIS CHECKED BY: ST	DIAGRAM REVIEWED BY: ST
SCALE:	NOT TO SCALE	
DATE:	3-9-2007	
LOG NUMBER:	SS# 04-01-255	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH



LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		T TRAM
	PAKED VEHICLE		BACKING		20 MPH TO 29		D DRIVER AT FAULT
	PARKING VEHICLE		SLOPESIDE		30 MPH TO 39		D DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W WET
	HEAD ON		HURRY		50 MPH TO 59		I ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		O ONLY
	RAN OFF ROAD				70 AND UP		



Revise Signal to
Provide Protected
Lefts from SR 1711
to US 70

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 4	AREA:
	STUDY PERIOD: 2/1/03 TO 11/30/06	
	DISTANCE: 1/4 MILE - 1/2 MILE	
	ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: ST		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE:	NOT TO SCALE	
DATE:	3-9-2007	
LOG NUMBER:	SS* 04-01-255	

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TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH