

Hazard Elimination Project Evaluation

Project Log # 200502094

Hazard Elimination Project W-3409

**Evaluation of the Traffic Signal Installation and Left Turn Lane Construction at the
Intersection of US 311 (New Walkertown Road) and SR 2381 (Williston Road)
Forsyth County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
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3/1/2006
Date

Traffic Safety Project Engineer

Hazard Elimination Project Evaluation Documentation

Subject Location

Evaluation of Hazard Elimination Project W-3409 –
The Intersection of US 311 (New Walkertown Road) and SR 2381 (Williston Road)
Forsyth County

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis and an Odds Ratio comparison analysis have been completed to measure the effectiveness of this hazard elimination project. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The safety countermeasures chosen for the subject location were to install a two-phase traffic signal and to construct left turn lanes on both approaches of US 311 (New Walkertown Road) and SR 2381 (Williston Road). US 311 (New Walkertown Road) is a 24' wide two-lane roadway with a pronounced crest vertical curve north of its intersection with SR 2381 (Williston Road). The speed limit on US 311 is 55 mph within the vicinity of the intersection. The speed limits on the westbound and eastbound approaches of SR 2381 (Williston Road) are 50 mph and 35 mph, respectively. A two-circuit flasher was installed at the subject location in 1990 and remained in operation until the two-phase traffic signal was installed.

The originally approved project called for lowering the crest vertical curve along US 311 by 8-9 feet. But after preliminary plans were developed, the cost for this project had doubled the original cost estimate and totaled \$525,000. The left turn lane construction and traffic signal were then chosen as a more economical and environmentally friendly alternative.

School busses and car-carriers cross US 311 (New Walkertown Road) at SR 2381 (Williston Road) on a regular basis. In addition, a railcar depot is located in the northwest quadrant of the intersection and produces additional truck traffic. Therefore the traffic signal design plans were designed to accommodate WB-50 Tractor-Trailer vehicles.

The initial crash analysis for this location was completed from October 1, 1990 through August 31, 1996 with a total of 13 reported crashes. According to the initial crash analysis, there were eight Angle crashes, two Rear-End crashes, one Left-Turn, Different Roadway crash, and two Left-Turn, Same Roadway crashes. These crashes resulted in one fatal injury crash, one class-A injury crash, five class-B injury crashes, and one class-C injury crash. The *Project Report* in the Project File Folder sites that the Angle and Rear End crashes were attributed to the restricted sight distance caused by the crest vertical curve. The project was completed on December 16, 1998 at an estimated cost of \$150,000.

Comparison Analysis

After reviewing the hazard elimination 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, 1998 through February 28, 1999. The before period consisted of reported crashes from July 1, 1992 through September 30, 1998 (6 Years, 3 Months) and the after period consisted of reported crashes from March 1, 1999 through May 31, 2005 (6 Years, 3 Months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The analysis also consisted of two different sets of data, the treatment and the comparison data. In order to include the entire length of the left turn lanes within the analysis, the treatment data consisted of all crashes on US 311 (New Walkertown Road) within 350 feet of the subject intersection and on SR 2381 (Williston Road) within 250 feet of the subject intersection. The comparison data consisted of all crashes within a 150 feet Y-line on US 311 (New Walkertown Road), from 150 feet south of Tracy Street to 150 feet north of SR 2391 (Dillon Farm Road). Please see attached *Location Map* for further detail.

The following data table depicts the Naive Before and After Analysis for the treatment and comparison information. 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. Rear End Crashes would have also been included within the Target Crashes, however none occurred in either the before or after period.

Treatment Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	15	6	-60.0%
Total Severity Index	15.55	5.93	-61.9%
Target Crashes	13	4	-69.2%
Target Severity Index	16.65	6.55	-60.7%
Volume	5400	5500	1.9%

Treatment - Target Crash Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Fatal Injury Crashes	1	0	-100.0%
Non-Fatal Injury Crashes	8	3	-62.5%
Total Injury Crashes	9	3	-66.7%
Night Crashes	4	1	-75.0%
Wet Crashes	2	0	-100.0%

Comparison Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	67	54	-19.4%
Total Severity Index	11.79	8.23	-30.2%
Target Crashes	30	23	-23.3%
Volume	3300	3500	6.1%

Odds Ratio: Treatment vs Comparison

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Treatment Total Crashes	15	6	---
Comparison Total Crashes	67	54	-50.4%

The naïve before and after analysis at the treatment location resulted in a 60.0 percent decrease in Total Crashes, a 61.9 percent decrease in the Total Severity Index, and a 1.9 percent increase in Average Daily Traffic (ADT). The comparison location resulted in a 19.4 percent decrease in Total Crashes, a 30.2 percent decrease in the Total Severity Index, and a 6.1 percent increase in ADT. The before period ADT year was 1995 and the after period ADT year was 2002.

The Odds Ratio is used as another means of calculating the treatment effect. The total crashes in the before and after period from the Comparison Strip are used to calculate the percent reduction in total crashes for the Treatment Intersection. As shown in the table above, using the Odds Ratio calculation, there is a 50.4 percent decrease in Treatment Intersection crashes.

Results and Discussion

The naïve before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 60.0 percent decrease in Total Crashes and a 69.2 percent decrease in Target Crashes. Further investigation shows that the Severity Index of Total Crashes and Target Crashes appear to have decreased by 61.9 percent and 60.7 percent, respectively. Using the Odds Ratio to calculate the treatment effect resulted in a 50.4 percent decrease in Total Crashes at the Treatment Intersection. The summary results above demonstrate that when using both analysis methods the treatment location appears to have had a decrease in the number and severity of Total and Target Crashes from the before to the after period.

A breakdown of the Target crashes in the before and the after period reveals the following results. In the before period there were thirteen Target crashes at the treatment location. This included nine Angle crashes, one Left Turn-Same Roadway crash, and three Left Turn-Different Roadway crashes. In the after period there were only four Target crashes at the treatment location, two Angle crashes and two Left Turn-Same Roadway crashes. Both of the Angle crashes in the after period were the result of a vehicle on SR 2381 (Williston Road) running through a red light in their direction of travel.

Because of the percentage of school busses, car-carriers, and other truck traffic that use the treatment location, the number of crashes in the before and after period that involved busses and trucks was also analyzed. Analysis revealed that only one crash in the before period involved a truck. This collision was an Angle crash that involved an eastbound SR 2381 vehicle and a southbound US 311 vehicle, and resulted in two fatal injuries. There were no truck-related crashes in the after period.

Please see the attached Treatment Site Photos. Photos are provided for all approaches of the Treatment Location. As shown in the photos, Signal Ahead Warning signs are placed in advance of the intersection on all approaches. The photos also show the crest vertical curve located north of the intersection.

As the Safety Evaluation Group completes additional reviews for this type of countermeasure, we will be able to provide more objective and definite information regarding actual crash reduction factors.

Treatment Site Photos (Taken on November 3, 2005)



Looking South on US 311 (New Walkertown Rd) in advance of the Treatment Intersection. Notice how the curvature of the roadway blocks the motorists' view of the intersection. The signal is barely visible in this photo. A Signal Ahead Warning sign is located at right.



Looking south on US 311 (New Walkertown Rd) at the Treatment Intersection.

Treatment Site Photos (Taken on November 3, 2005)



Looking north on US 311 (New Walkertown Rd) from the Treatment Intersection.
Another view of the vertical curves located north of the intersection.



Looking North on US 311 (New Walkertown Rd) in advance of the Treatment Intersection.
Notice the Signal Ahead Warning sign.

Treatment Site Photos (Taken on November 3, 2005)



Looking north on US 311 (New Walkertown Rd) at the Treatment Intersection.



Looking East on SR 2381 (Williston Rd) in advance of the Treatment Intersection.
Notice the Signal Ahead Warning sign.

Treatment Site Photos (Taken on November 3, 2005)



Looking East on SR 2381 (Williston Rd) at the Treatment Intersection.



Looking West on SR 2381 (Williston Rd) in advance of the Treatment Intersection.
The Signal Ahead Warning sign is placed just behind the location where this photo was taken.

Treatment Site Photos (Taken on November 3, 2005)



Looking West on SR 2381 (Williston Rd) at the Treatment Intersection.

US 311(New Walkertown Rd) at SR 2381(Williston Rd)

Forsyth Co.

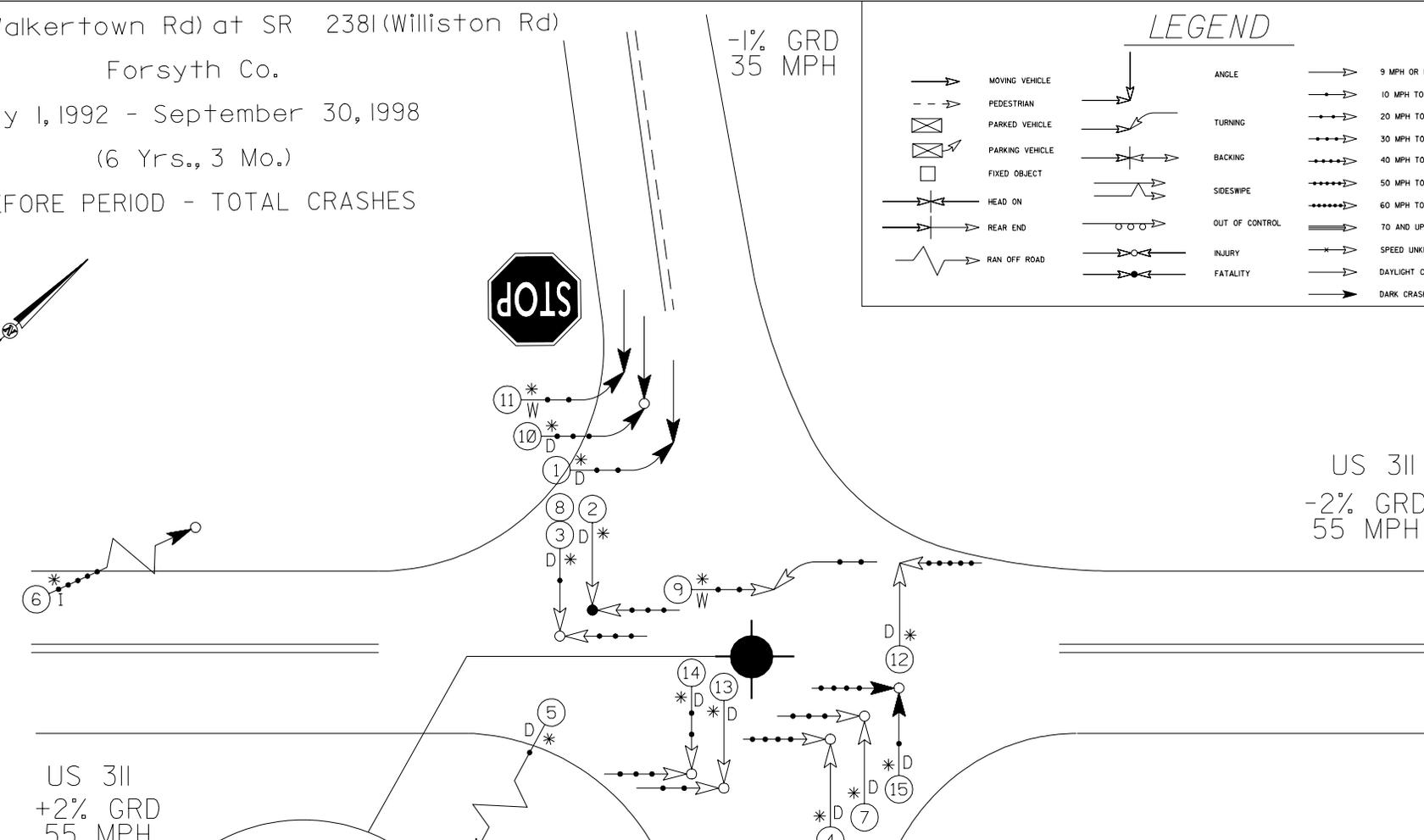
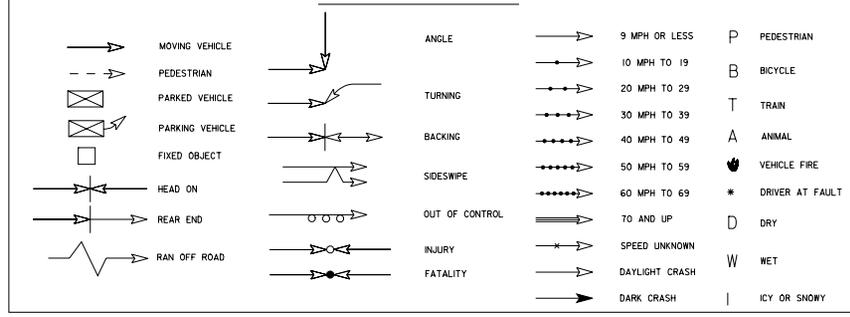
July 1, 1992 - September 30, 1998

(6 Yrs., 3 Mo.)

BEFORE PERIOD - TOTAL CRASHES

-1% GRD
35 MPH

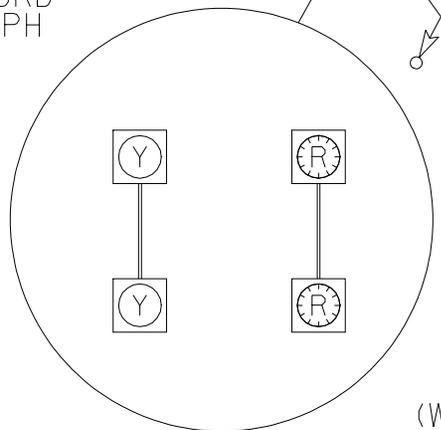
LEGEND



US 311
-2% GRD
55 MPH

US 311
+2% GRD
55 MPH

SR 2381
(WILLISTON RD)
+1% GRD
50 MPH



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT		COLLISION DIAGRAM	
<small>HIGHWAY SAFETY IMPROVEMENT PROGRAM</small>	<small>SAFETY INFORMATION MANAGEMENT AND SUPPORT</small>	DIVISION: 9	REGION: TRIAD
		STUDY PERIOD: 07/01/92 - 09/30/98	
		ANALYSIS PREPARED BY: CLS	
		DIAGRAM PREPARED BY: CLS	
SAFETY EVALUATION		DIAGRAM REVIEWED BY:	
INTERSECTION OF US 311 AT SR 2381 (WILLISTON RD)		SCALE: NOT TO SCALE	
		DATE: 02/02/06	
		LOG NUMBER: 200502094	
		PAGE: 1 OF 1	
N.C. DEPARTMENT of TRANSPORTATION DIVISION of HIGHWAYS TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH			

US 311 (New Walkertown Rd) at SR 2381 (Williston Rd)

Forsyth Co.

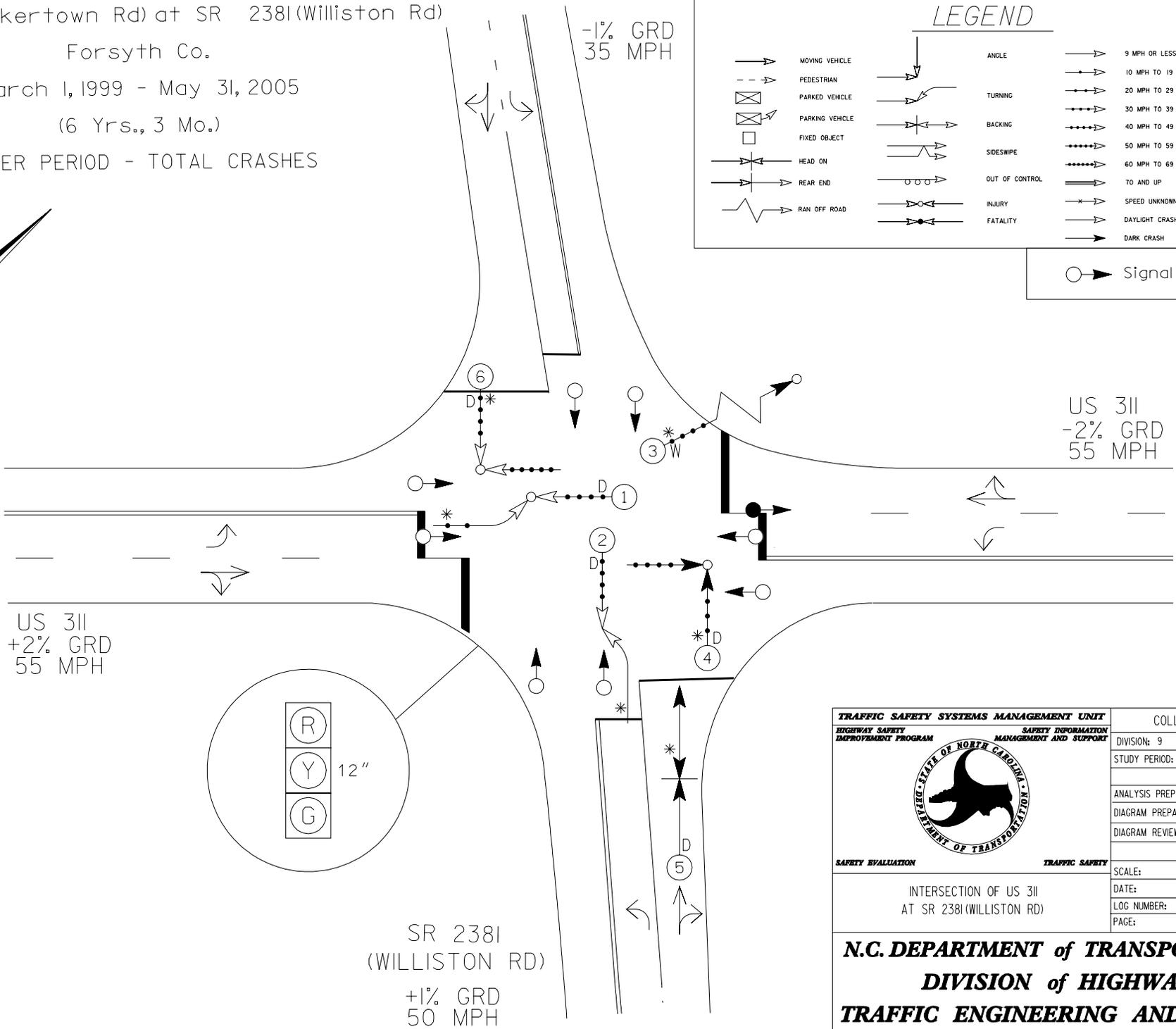
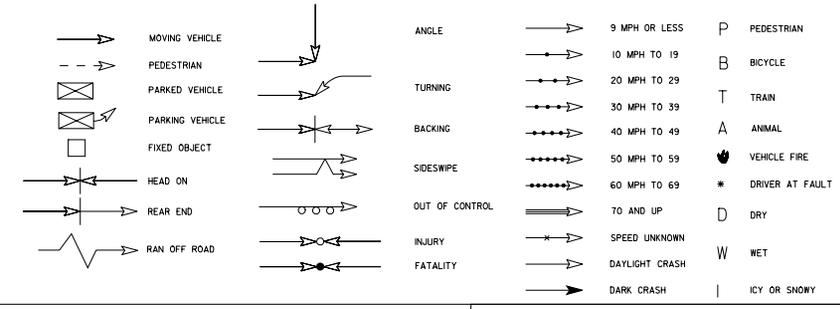
March 1, 1999 - May 31, 2005

(6 Yrs., 3 Mo.)

AFTER PERIOD - TOTAL CRASHES

-1% GRD
35 MPH

LEGEND



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT		COLLISION DIAGRAM	
<small>HIGHWAY SAFETY IMPROVEMENT PROGRAM</small>	<small>SAFETY INFORMATION MANAGEMENT AND SUPPORT</small>	DIVISION: 9	REGION: TRIAD
		STUDY PERIOD: 03/01/99 - 05/31/05	
		ANALYSIS PREPARED BY: CLS	
SAFETY EVALUATION		TRAFFIC SAFETY	
INTERSECTION OF US 311 AT SR 2381 (WILLISTON RD)		SCALE:	NOT TO SCALE
		DATE:	02/02/06
		LOG NUMBER:	200502094
		PAGE:	1 OF 1
N.C. DEPARTMENT of TRANSPORTATION DIVISION of HIGHWAYS TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH			