

# **Spot Safety Project Evaluation**

Project Log # 200512157

Spot Safety Project # 05-99-020

**Spot Safety Project Evaluation of the Traffic Signal Installation  
At the Intersection of SR 2000 (Falls of Neuse Rd) and  
SR 2002 (Ravens Ridge Rd)  
Also Includes Installation of Through, Right, and Left Turn Lanes  
Wake 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**

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Brad Robinson, EI

3/29/2007  
Date

Traffic Safety Project Engineer

# ***Spot Safety Project Evaluation Documentation***

## **Subject Location**

Evaluation of Spot Safety Project Number 05-99-020 – The Intersection of SR 2000 (Falls of Neuse Rd) at SR 2002 (Ravens Ridge Rd) in Wake County.

## **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasure chosen for the subject location was the installation of a traffic signal. SR 2000 (Falls of Neuse Rd) and SR 2002 (Falls of Neuse Rd) were both 2-lane roads in the before period. The westbound approach of SR 2002 had a speed limit of 45 mph, while all other approaches had a speed limit of 55 mph. The subject intersection is a 4-leg intersection which was controlled by stop signs on SR 2002 (Ravens Ridge Rd) in the before period.

Less than two years after the traffic signal installation the City of Raleigh widened Falls of Neuse Road. As part of the project left turn lanes were constructed on all approaches at the intersection. In addition, another through lane was constructed on southbound SR 2000, a right turn lane was constructed on northbound SR 2000, and the speed limit on SR 2000 was reduced to 45 mph. The left turn lane on the southern leg of SR 2000 extends southward into a center turn lane. According to aerial photos the eastbound SR 2002 left turn lane was extended by approximately 300 feet between late 2004 to early 2005. See the attached *Aerial Photos*.

The original statement of problem was that vehicles on SR 2002 (Ravens Ridge Rd) could not safely enter the intersection due to insufficient gaps in traffic. Two private citizens originally requested the signal investigation. After the investigation, it was determined that the intersection satisfied traffic signal warrants 2, 9, and 11.

The initial crash analysis was completed from January 1, 1996 to December 31, 1998 with 8 reported crashes, with 1 that was considered correctable by the chosen countermeasure. The final completion date for the improvement at the subject intersection was on August 22, 2000 with a total cost of \$45,000.00.

## **Naive Before and After Analysis**

Due to the short time frame between the signal installation and the City of Raleigh's widening project, the before period consists of data prior to the signal installation and the after period consists of data after the construction of the new lanes. Therefore, the construction period consists of the entire time period between the signal installation and the construction of the lanes. 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 July 1, 2000 to March 31, 2002. The before period consisted of reported crashes from May 1, 1996 through June 30, 2000 (4 years and 2 months) and the after period consisted of reported crashes from April 1, 2002 through May 31, 2006 (4 years and 2 months). The extension of the eastbound left-turn lane is

included in the after period due to its apparent lack of influence on crashes at the intersection. The ending date for this analysis was determined by the available crash data at the time the analysis was completed.

The treatment data consisted of all crashes within 150 feet of the left-turn lane tapers on each approach to the intersection. This measures 600 feet north and 350 feet south of the intersection on SR 2000, and 900 feet west and 500 feet east of the intersection on SR 2002. The 900 feet west of the intersection includes the additional 300 feet that was added to the eastbound left turn lane mentioned in the project background section.

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; Head on; and Angle.

<b><u>Treatment Information</u></b>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total crashes	27	41	51.9
Total Severity Index	3.74	3.89	4.0
Target Crashes	7*	15**	114.3
Target Crash Severity Index	5.23	4.95	-5.4
Volume	11,800	23,800	101.7
<b><u>Crash Severity Summary</u></b>			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	2	7	250.0
Class C Crashes	8	9	12.5
PDO Crashes	17	25	47.1

\*Before Period Crash #9 was not considered a Target Crash. A left-turning vehicle went left of center and hit a stopped vehicle.

\*\*After Period Crash #37 was not considered a Target Crash. A right-turning vehicle went left of center after turning.

The naive before and after analysis at the treatment location resulted in a 52 percent increase in Total Crashes, a 114 percent increase in Target Crashes, a 4 percent increase in the Total Severity Index, and a 102 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1998 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 52 percent increase in Total Crashes and a 114 percent increase in Target Crashes, with a 102 percent increase in ADT. The Total Severity Index increased

by 4 percent and the Target Crash Severity Index decreased by 5 percent. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have increased at the treatment location from the before to the after period.

The large increase in Target Crashes can be attributed to a large increase in Left-Turn, Same Roadway Crashes. In the before period there was only one such crash and in the after period there were 10, an increase of 900 percent.

The ADT in the area underwent a large increase from the before period to the after period (102%). After conducting a field investigation, it was observed that there were several new neighborhoods in the area around the intersection. The increase in traffic at the intersection is likely to have contributed to the increase in both Total Crashes and Target Crashes at the intersection.

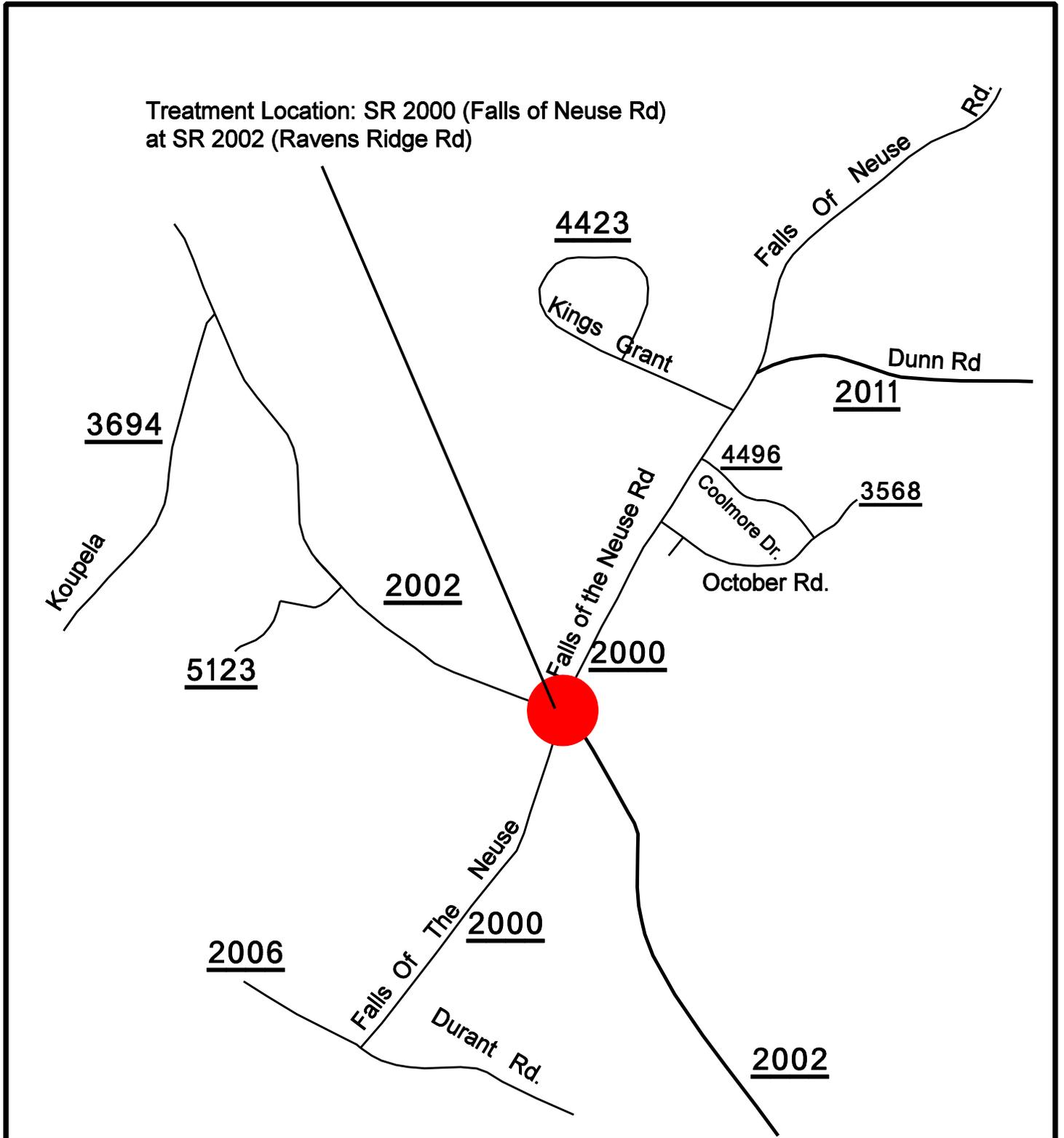
Referencing the *Collision Diagrams*, there was a Rear-End Crash Pattern on northbound SR 2000 (Falls of Neuse Rd) which was reduced after the signal and turn lanes were added. In the before period there were 10 Rear-End Crashes, while in the after period there were 5, for a reduction of 50 percent. The crash pattern in the before period was probably related to vehicles on SR 2000 waiting for a gap in traffic so they could turn left. After the addition of the left turn lane the drivers had a refuge to wait in while allowing northbound traffic to continue uninterrupted.

The benefit to cost ratio could not be calculated for this project due to the City of Raleigh's project to widen Falls of Neuse. The project was constructed soon after the signal was installed and included significant changes at the intersection. Since no cost information is known about the project, the ratio could not be calculated.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection. Also included are three *Aerial Photos* which show the intersection in the before period, the after period before the eastbound left-turn lane was extended, and the after period after the turn lane was extended.

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 Wake County Evaluation of Spot Safety Project 05-99-020



Aerial Photos From Wake County GIS Webstie



1999



2004



2005

**Treatment Site Photos Taken October 11, 2006**



Looking Northbound on SR 2000 (Falls of Neuse Rd)



Looking Southbound on SR 2000 (Falls of Neuse Rd)



Looking Eastbound on SR 2002 (Raven Ridge Rd)



Looking Eastbound on SR 2002 (Raven Ridge Rd)



Looking Westbound on SR 2002 (Raven Ridge Rd)

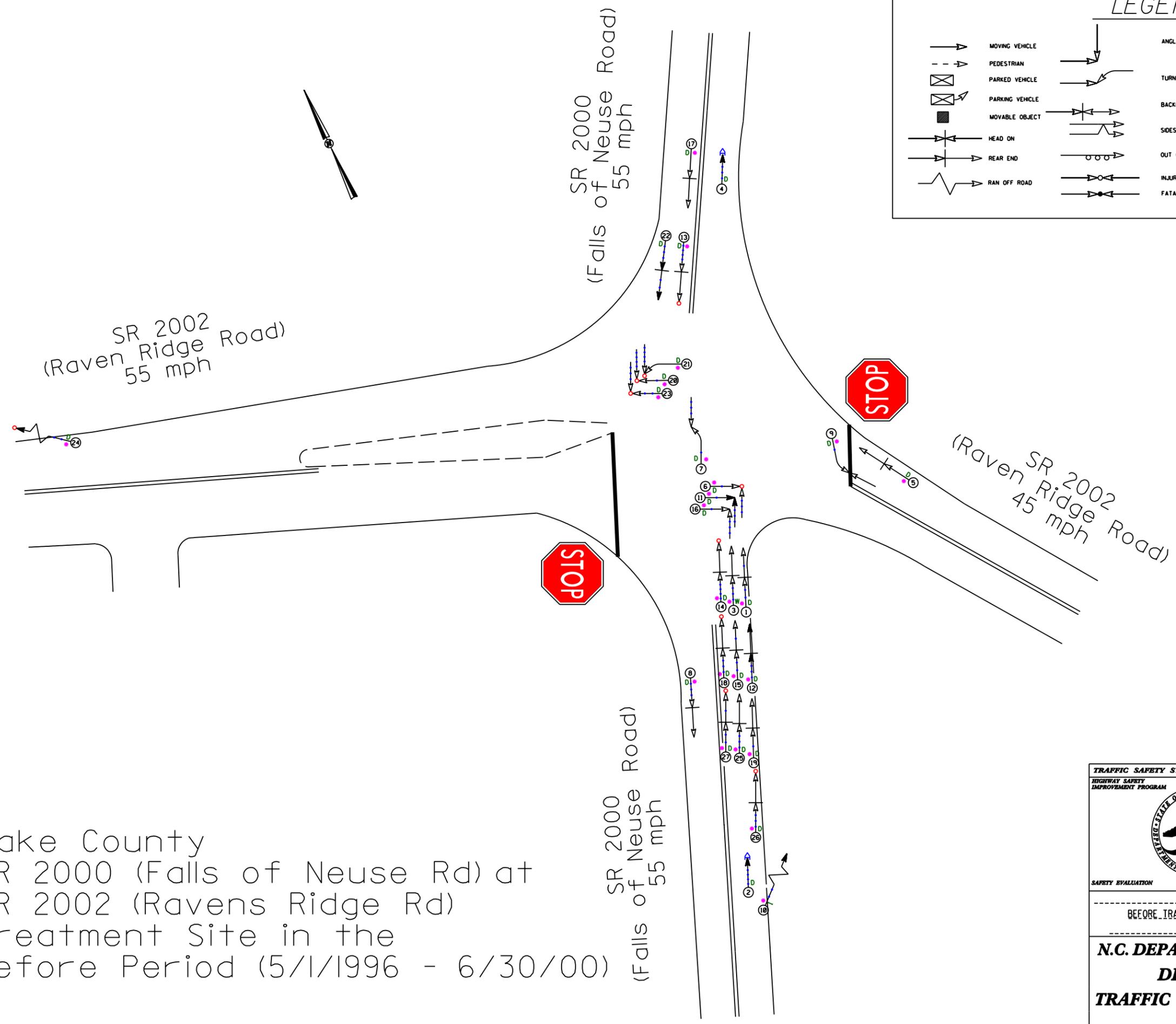
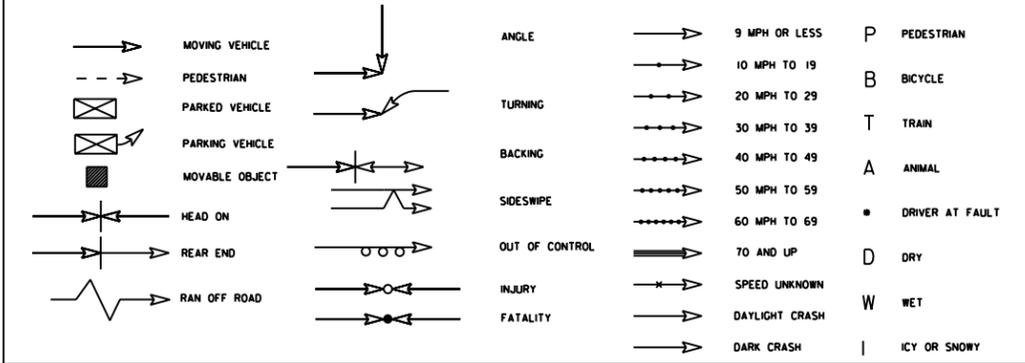


Looking Westbound on SR 2002 (Raven Ridge Rd)



Traveling Westbound on SR 2002, Looking left at the Intersection

LEGEND



Wake County  
 SR 2000 (Falls of Neuse Rd) at  
 SR 2002 (Ravens Ridge Rd)  
 Treatment Site in the  
 Before Period (5/1/1996 - 6/30/00)

<b>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</b> <small>HIGHWAY SAFETY IMPROVEMENT PROGRAM</small>		<b>COLLISION DIAGRAM</b> <small>SAFETY INFORMATION MANAGEMENT AND SUPPORT</small>	
		DIVISION: 5	AREA: ..
		STUDY PERIOD: 5/1/1996 TO 6/30/2000	
		DISTANCE: ..... Y-LINE: 150 FT	
		ANALYSIS PREPARED BY: B. Robbioso	
		DIAGRAM PREPARED BY: B. Robbioso	
DIAGRAM REVIEWED BY: .....			
SAFETY EVALUATION		TRAFFIC SAFETY	
BEFORE TRAFFIC SIGNAL INSTALL		SCALE: NOT TO SCALE	
		DATE: October 2006	
		LOG NUMBER: 200512157	
<b>N.C. DEPARTMENT of TRANSPORTATION</b> <b>DIVISION of HIGHWAYS</b> <b>TRAFFIC ENGINEERING AND SAFETY</b> <b>SYSTEMS BRANCH</b>			

Wake County  
 SR 2000 (Falls of Neuse Rd) at  
 SR 2002 (Ravens Ridge Rd)  
 Treatment Site in the  
 After Period (4/1/2002 - 5/31/2006)



**LEGEND**

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		BICYCLE
	PARKED VEHICLE		BACKING		20 MPH TO 29		TRAIN
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		ANIMAL
	MOVABLE OBJECT		OUT OF CONTROL		40 MPH TO 49		ANIMAL
	HEAD ON		INJURY		50 MPH TO 59		ANIMAL
	REAR END		FATALITY		60 MPH TO 69		ANIMAL
	RAN OFF ROAD		DAYLIGHT CRASH		70 AND UP		DRY
			DARK CRASH		SPEED UNKNOWN		WET
					DAYLIGHT CRASH		ICY OR SNOWY

SR 2002  
 (RAVEN RIDGE RD)  
 45 mph

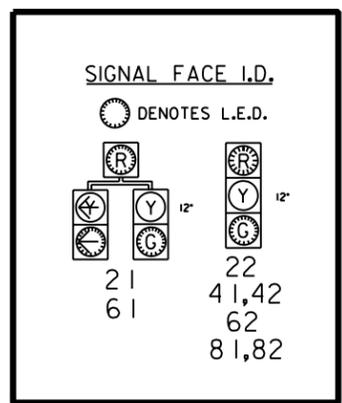
SR 2000  
 (FALLS OF NEUSE RD)  
 45 mph

SR 2002  
 (RAVEN RIDGE RD)  
 45 mph

SR 2000  
 (FALLS OF NEUSE RD)  
 45 mph

Note: Vehicle was waiting for signal and was hit by a fire that came disconnected from a trailer

Note: Driver made a right turn from SR 2000, lost control, and crossed the centerline



<b>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</b>		<b>COLLISION DIAGRAM</b>	
<small>HIGHWAY SAFETY IMPROVEMENT PROGRAM</small>	<small>SAFETY INFORMATION MANAGEMENT AND SUPPORT</small>	DIVISION: 5	AREA: ..
		STUDY PERIOD: 4/1/2002 TO 5/31/2006	
		DISTANCE: ..... Y-LINE: 150 FT	
		ANALYSIS PREPARED BY: B. Robbioso	
		DIAGRAM PREPARED BY: B. Robbioso	
		DIAGRAM REVIEWED BY: .....	
<b>SAFETY EVALUATION</b>		<b>TRAFFIC SAFETY</b>	
AFTER TRAFFIC SIGNAL INSTALL		SCALE: NOT TO SCALE	
		DATE: October 2006	
		LOG NUMBER: 20052157	
<b>N.C. DEPARTMENT of TRANSPORTATION</b> <b>DIVISION of HIGHWAYS</b> <b>TRAFFIC ENGINEERING AND SAFETY</b> <b>SYSTEMS BRANCH</b>			