

# Project Evaluation

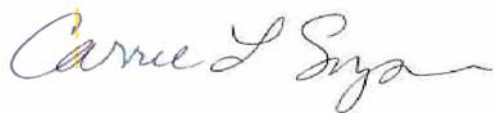
Project Log # 200506184

**Evaluation of the Conversion from Two-Way Stop Sign Control to Four-Way Stop Sign Control at the Intersection of SR 1006 (Clinton Road) and SR 1835 (Rockhill Road)  
Cumberland 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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Carrie L. Simpson, PE

5/23/08  
Date

Traffic Safety Project Engineer

# ***Project Evaluation Documentation***

## **Subject Location**

Evaluation of the Four Way Stop Sign Installation at the Intersection of SR 1006 (Clinton Road) and SR 1835 (Rockhill Road), Cumberland County

## **Project Information and Background**

The safety improvement chosen for the subject location was the conversion from two-way stop sign control to four-way stop sign control, which was completed by installing stop signs, pavement markings, and converting the existing standard flasher to indicate a stop condition for all four approaches. Prior to the project improvement, the intersection was controlled by stop signs located on SR 1835 (Rockhill Road). Both SR 1006 (Clinton Road) and SR 1835 (Rockhill Road) are two-lane facilities at the treatment intersection with a speed limit of 45 mph.

Traffic Engineering staff recognized this location as needing safety improvements because it was experiencing a large number of Frontal Impact Crashes. Vehicles on SR 1835 (Rockhill Road) were choosing improper gaps and were struck by fast approaching vehicles on SR 1006 (Clinton Road) when entering the intersection. The safety treatments were intended to alleviate this crash pattern by lowering vehicle speeds when travelling through the intersection.

The Four-Way Stop improvements were installed and operational on January 25, 2005.

## **Naïve Before and After Analysis**

After reviewing all of the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from January 1, 2005 through February 28, 2005. The before period consisted of reported crashes from January 1, 2002 through December 31, 2004 (3 Years) and the after period consisted of reported crashes from March 1, 2005 through February 29, 2008 (3 Years). The ending date for this analysis was determined by the available after period crash data.

The treatment data consisted of all crashes within 150 feet of the intersection of SR 1006 (Clinton Road) and SR 1835 (Rockhill Road). Please see the attached *Location Map* for further detail.

The following table depicts the Naïve Before and After Analysis for the Total Crashes and Target Crashes at 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.

<u>Treatment Information</u>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-)/ Percent Increase (+)</b>
Total Crashes	14	6	-57.1%
Total Severity Index	11.17	5.93	-46.9%
Target Crashes	14	5	-64.3%
Target Severity Index	11.17	6.92	-38.0%
Volume	6100	5200	-14.8%

<u>Target Crash Information</u>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-)/ Percent Increase (+)</b>
Fatal Crashes	1	0	-100.0%
Class A Crashes	0	0	N/A
Class B Crashes	1	1	0.0%
Class C Crashes	8	3	-62.5%
Injury Crashes	10	4	-60.0%
PDO Crashes	4	1	-75.0%

The naïve before and after analysis at the treatment location resulted in a 57 percent decrease in Total Crashes, a 64 percent decrease in Target Crashes, and a 15 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 2003 and the after period ADT year was 2006.

## **Results and Discussion**

The naïve before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in 57 percent decrease in Total Crashes and a 64 percent decrease in Target Crashes. The summary results above demonstrate that the Treatment Location appears to have had a substantial decrease in both Total and Target Crashes from the before to after period using naïve methodologies.

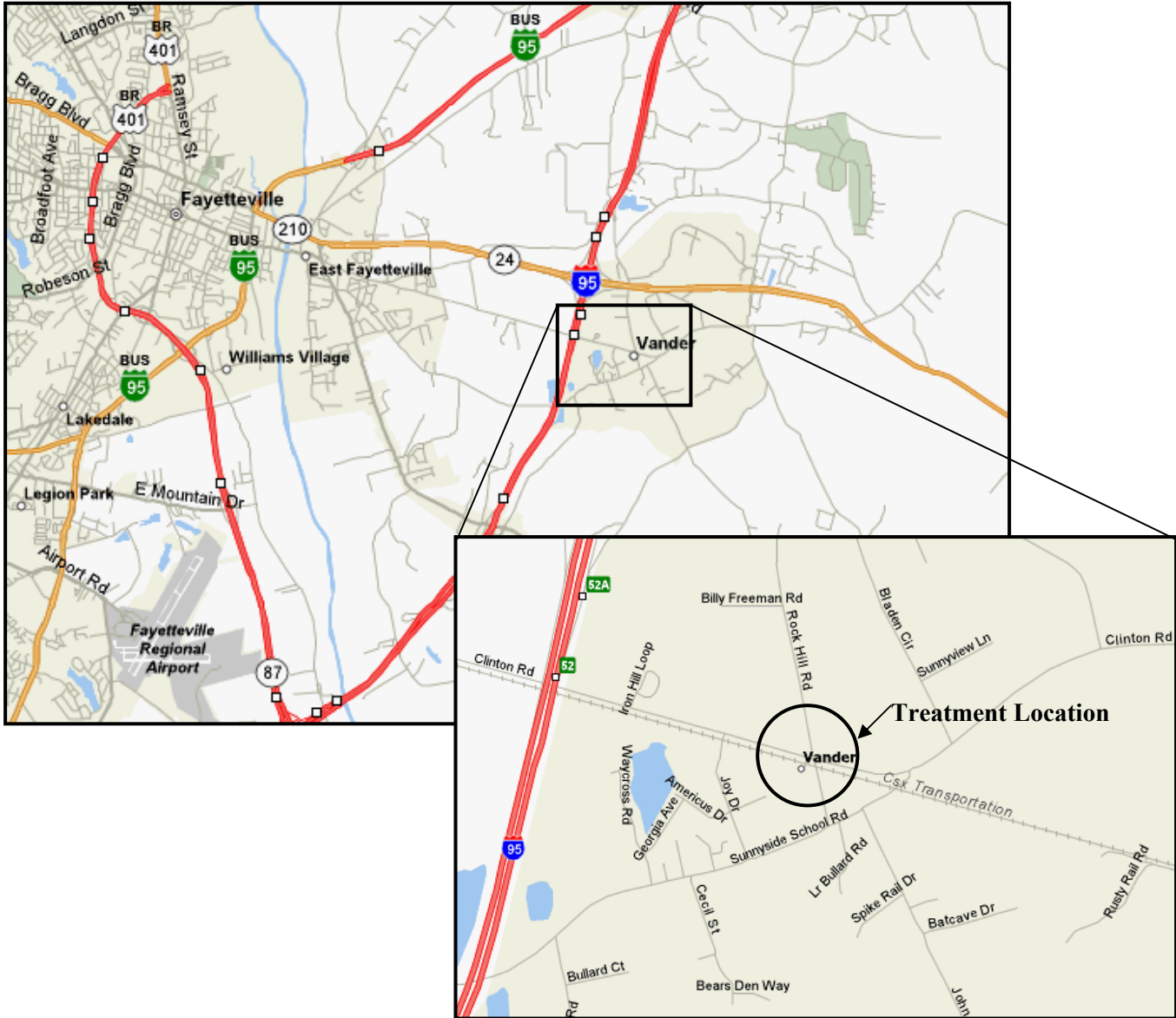
The treatment location experienced a substantial decrease in the Severity Index of Total and Target Crashes from the before to the after period. The Total and Target Severity Index decreased by 47 and 38 percent, respectively. The number of Target Injury Crashes decreased by 60 percent. In the before period, Target Crashes resulted in ten injury crashes and four PDO crashes. In the after period, Target Crashes resulted in four injury crashes and one PDO crash.

Analysis of the crash data in the after period reveals that four of the six crashes at the treatment intersection were caused by the vehicles at fault running through the stop signs on SR 1006 (Clinton Road), resulting in two class-C and one class-B injury crash. See crash # 1, 2, 5, and 6 in the *Collision Diagram – After Period* for more detail.

Although the number of crashes involving stop sign runners increased in the after period, vehicle speeds at impact decreased for most vehicles. Due to the four-way stop condition, the speeds of vehicles not at fault (those which stopped at the intersection before proceeding) were at 10 mph or less at impact in all after period crashes. The reduced vehicle speeds at impact helps to explain the decrease in crash severity at the Treatment 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.

Location Map, Cumberland County  
Evaluation of Four Way Stop Sign Installation



Treatment Location: SR 1006 (Clinton Road) at SR 1835 (Rockhill Road)

*Treatment Site Photos (Taken on February 25, 2005)*



Looking North on SR 1835 (Rockhill Rd)



Looking South on SR 1835 (Rockhill Rd)

*Treatment Site Photos (Taken on February 25, 2005)*



Looking East on SR 1006 (Clinton Rd)



Looking West on SR 1006 (Clinton Rd)

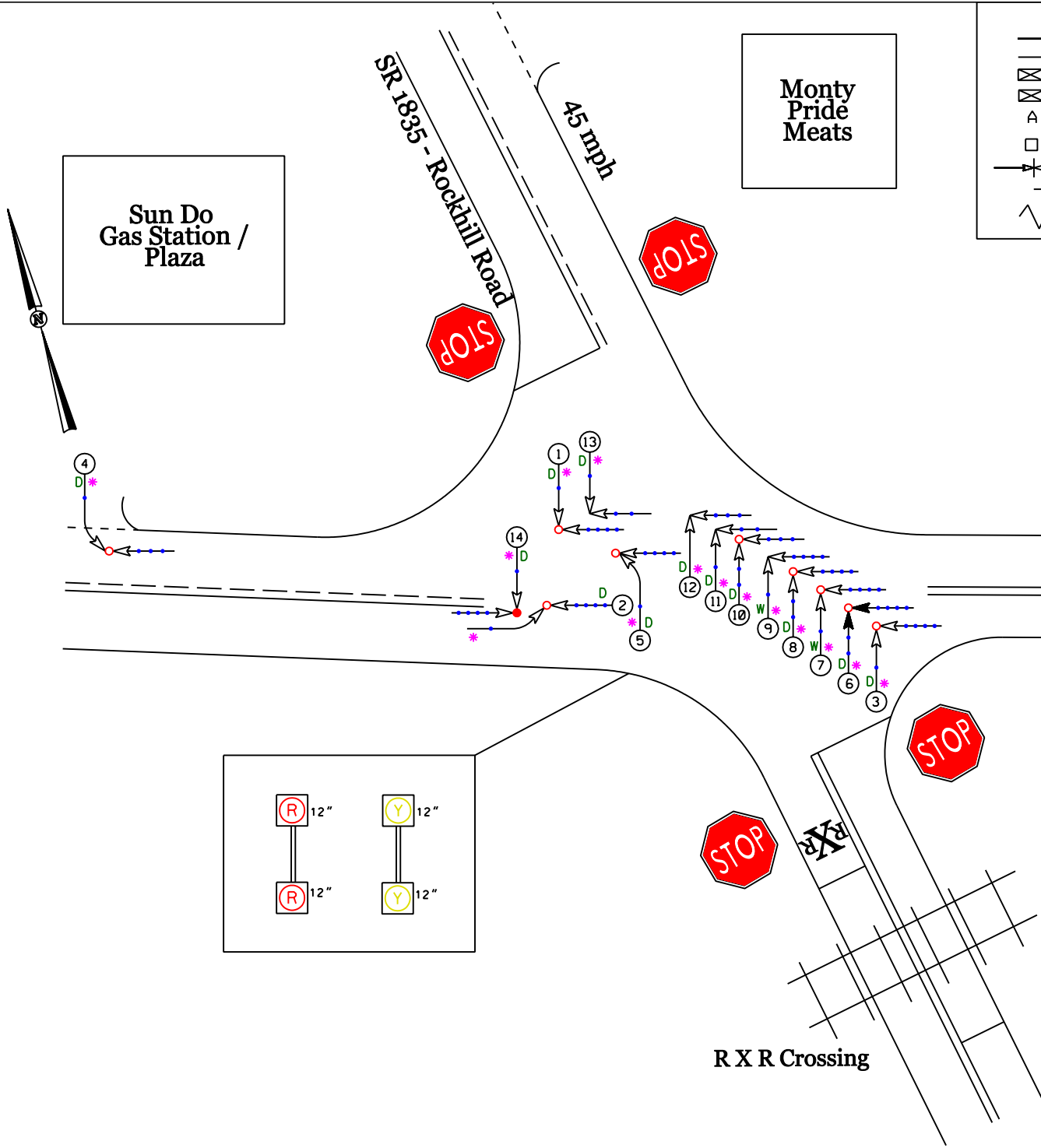
*Treatment Site Photos (Taken on February 25, 2005)*



Looking North on SR 1835-Rockhill Rd (Above) and West on SR 1006-Clinton Rd (Below).  
“Stop Ahead” warning signs and pavement markings were placed on all approaches after the traffic control was converted to a four-way stop in order to warn motorists of the new traffic pattern.



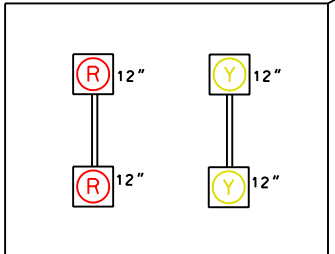




**LEGEND**

	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
	DEER		OUT OF CONTROL		40 MPH TO 49		WET
	FIXED OBJECT		INJURY		50 MPH TO 59		ICY OR SNOW
	HEAD ON		FATALITY		60 MPH TO 69		TO AND UP
	REAR END		SPEED UNKNOWN		TO AND UP		SPEED UNKNOWN
	RAN OFF ROAD				TO AND UP		SPEED UNKNOWN

Before Period  
1/1/2002 - 12/31/2004  
(3 years)



<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: 6_	AREA: ..
		STUDY PERIOD: 12/02... TO 12/31/04...	DISTANCE: ..... Y-LINE: 150 FT
		ANALYSIS PREPARED BY: CLS.....	DIAGRAM PREPARED BY: CLS.....
<small>SAFETY EVALUATION</small>		<small>TRAFFIC SAFETY</small>	
SR_1006_of_SR_1835...BEFORE_PERIOD.....		SCALE:	NOT TO SCALE
.....		DATE:	5/23/08.....
.....		LOG NUMBER:	200506184

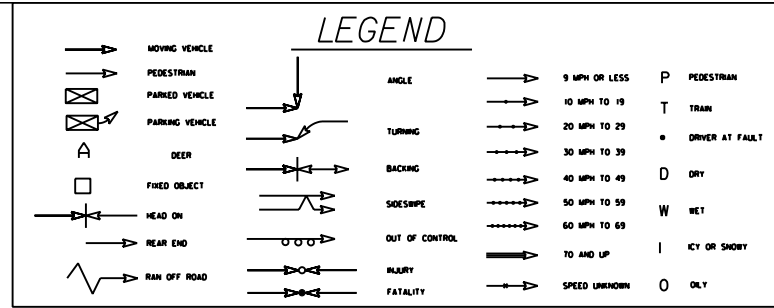
**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRAFFIC ENGINEERING AND SAFETY**  
**SYSTEMS BRANCH**

R X R Crossing

Sun Do Gas Station / Plaza

SR 1835 - Rockhill Road  
45 mph

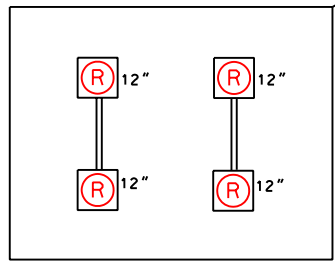
Monty Pride Meats



After Period  
3/1/2005 - 2/29/2008  
(3 years)

45 mph

SR 1006 - Clinton Road



STOP

STOP STOP

R X R Crossing

<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: 6..	AREA: ..
		STUDY PERIOD: 3/1/05.. TO 2/29/08..	
		DISTANCE: .....	Y-LINE: 150 FT
<small>SAFETY EVALUATION</small>		ANALYSIS PREPARED BY: CLS.....	
<small>TRAFFIC SAFETY</small>		DIAGRAM PREPARED BY: CLS.....	
SR 1006..at..SR 1835..-..AFTER PERIOD.....		DIAGRAM REVIEWED BY: .....	
DATE: 5/23/08.....		SCALE: NOT TO SCALE	
LOG NUMBER: 200506184			

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