

# **Spot Safety Project Evaluation**

Project Log # 200501225

Spot Safety Project # 04-98-217

**Spot Safety Project Evaluation of the Flashing Traffic Signal Installation at the Intersection of  
SR 2371 Old Cornwallis Rd. and SR 2372 Edwards Rd. in Johnston 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**

\_\_\_\_\_  
Samuel D. Coleman

07/05/2005  
Date

Traffic Safety Project Engineer

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

## **Subject Location**

Evaluation of Spot Safety Project Number 04-98-217 – The Intersection of SR 2371 and SR 2372 in Johnston 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 of the treatment versus comparison data has been completed to measure the effectiveness of the spot safety improvement. 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 spot safety project improvement countermeasure chosen for the subject location was the installation of a flashing traffic signal. SR 2371 is a two-lane facility with no left turn lanes at the intersection with SR 2372. SR 2372 is also a two-lane facility with no left turn lanes. SR 2372 and SR 2371 both have a speed limit of 55 mph. The intersection is controlled by stop signs on SR 2372 in the before period and SR 2371 in the after period. Although the accident history at this location does not indicate a current accident problem, the potential for accidents was believed to increase dramatically when the Princeton Rock Quarry relocated its main entrance. There were no injuries reported in the 2 crashes in the before period, both were angle type crashes. The final completion date for the construction of the flashing traffic signal was December 23, 1998.

## **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 November 1998 through January 1999. The before period consisted of reported crashes from April 1, 1993 through October 31, 1998 (5 Years, 7 Months) and the after period consisted of reported crashes from February 1, 1999 through August 31, 2004 (5 Years, 7 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. The treatment data consisted of all crashes within 150 feet of the subject intersection. The comparison data consisted of all crashes within 150 feet, at the intersections only, from MP 0 to MP 6.682 on SR 2372. The following data table depicts the Naive Before and After Analysis for the above information. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. These 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	2	2	0.0
Total Severity Index	1	42.6	4160.0
Frontal Impact Crashes	2	2	0.0
Frontal Severity Index	1	42.6	4160.0
Volume	2100	2000	-4.7
<u>Comparison Information</u>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total crashes	13	35	169.2
Total Severity Index	7.4	6.5	-11.4
Frontal Impact Crashes	6	16	166.6
Frontal Severity Index	13.63	5.6	-58.7
Volume	1300	1400	7.6
<u>Odds Ratio: Treatment versus Comparison</u>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Treatment Total Crashes	2	2	<b>-62.8</b>
Comparison Total Crashes	13	35	
Treatment F.I. Crashes	2	2	<b>-62.5</b>
Comparison F.I. Crashes	6	16	

The naive before and after analysis at the treatment location resulted in a 0.0 percent change in Total Crashes, a 4160.0 percent increase in Frontal Impact Crashes, and a 4.7 percent decrease in Average Daily Traffic (ADT). The comparison locations resulted in a 169.2 percent increase in Total Crashes, a 166.6 percent increase in Frontal Impact Crashes, and a 7.6 percent increase in ADT. The before period ADT year was 1995 and the after period ADT year was 2001.

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 below, using the Odds Ratio calculation, there is a 62.8 percent decrease in Treatment Intersection crashes and a 62.5 percent decrease in Frontal Impact crashes.

## **Results and Discussion**

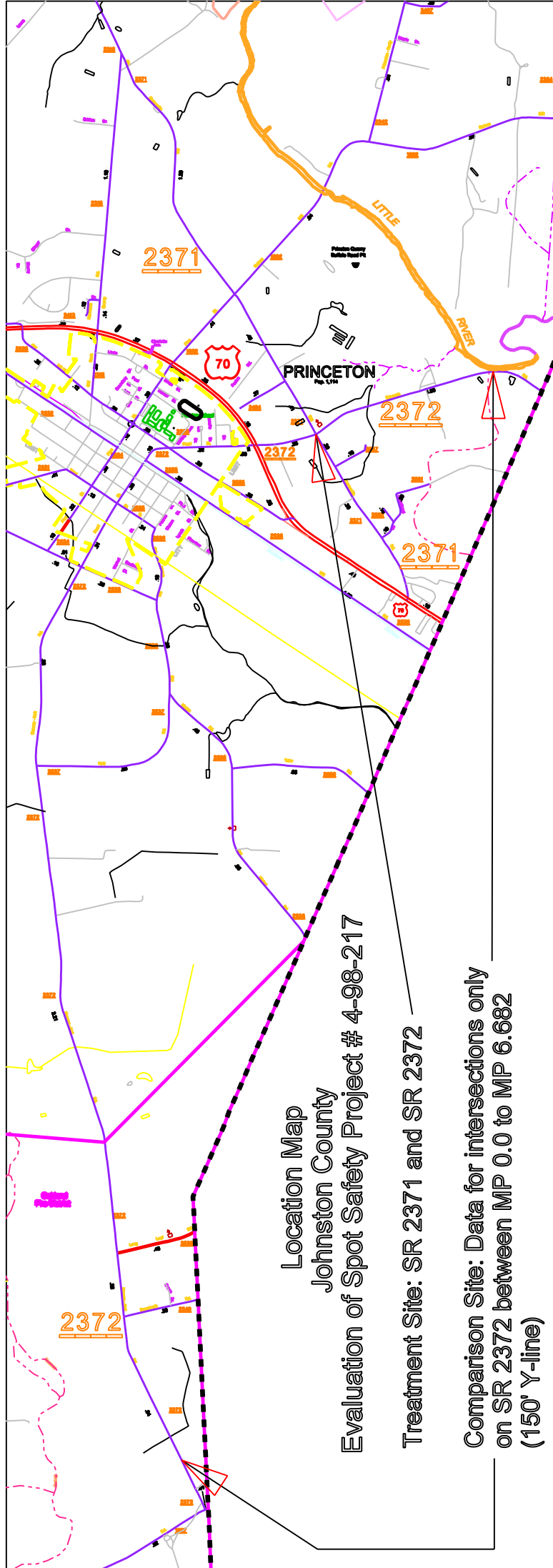
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 0.0 percent change in Total Crashes and a 0.0 percent change in Frontal Impact Crashes. Using the Odds Ratio to calculate the treatment effect resulted in a 62.8 percent decrease in Total Crashes at the Treatment Intersection and a 62.5 percent decrease in Frontal Impact crashes. The summary results above demonstrate that the treatment location appears to have had no change in the number of Total Crashes and no change in the number of Frontal Impact Crashes from the before to the after period.

As previously mentioned, the flashing traffic signal was installed as a preemptive counter-measure to deter an increase in crashes. The stop condition was also reversed upon completion of the revised entrance to the quarry. Although the crashes were more severe in the after period (1 A injury and 1 B injury), the quantity was kept to a minimum as expected.

There was a total 4 of crashes in the before and after period, all involving eastbound vehicles, which may indicate a problem from that direction. Observing the pictures included, there is a fence and with vegetation on the west approach looking north and shrubbery on a higher elevation on the west approach looking south which may present a sight distance problem.

Outside of the two observations the treatment intersection remained well controlled. The foresight used in this situation seemed to succeed despite the increase in severity of frontal impacts. The more serious injuries may be a cause of higher speeds, seeing that they are similar crashes in both periods.

The countermeasure crash reduction for Total Crashes at the subject intersection can be in the range of a 0.0 to a 62.8 percent decrease in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection can be in the range of a 0.0 to a 62.5 percent decrease in crashes. 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.



Stopped on North approach looking West



Stopped on North approach looking East

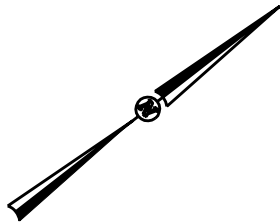


Stopped on South approach looking West



Stopped on South approach looking East





**LEGEND**

	MOVING VEHICLE		VEHICLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		B BICYCLE
	PAKED VEHICLE		BACKING		20 MPH TO 29		T TRUCK
	BACKING VEHICLE		30 MPH TO 39		40 MPH TO 49		A ANIMAL
	40 MPH TO 49		50 MPH TO 59		60 MPH TO 69		• DRIVER AT FAULT
	60 MPH TO 69		70 MPH OR UP		SPEED UNKNOWN		D DRIVER
	70 MPH OR UP		OUT OF CONTROL		75 MPH OR UP		W WET
	75 MPH OR UP		RIGHT		80 MPH OR UP		I ICY OR SNOWY
	80 MPH OR UP		LEFT		85 MPH OR UP		
	85 MPH OR UP		FATALITY				

Treatment Site - TotalCrashes  
 Before Period  
 April 1, 1993 - October 31, 1998  
 (5 years 6 months)  
 Johnston County

SR 2371 (OLD CORNWALLIS RD)  
 55 MPH

SR 2372 (EDWARDS RD)  
 55 MPH



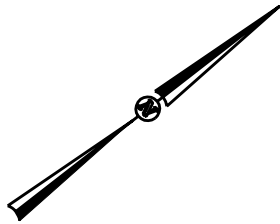
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<b>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</b>		<b>COLLISION DIAGRAM</b>	
	HIGHWAY SAFETY IMPROVEMENT PROGRAM	SAFETY INFORMATION MANAGEMENT AND SUPPORT	DIVISION .. AREA ..
STUDY PERIOD: 4/1/1993 TO 10/31/1998		DISTANCE: ..... T-LINE: 150 FT	
ANALYSIS PREPARED BY: S. CONROD		DIAGRAM PREPARED BY: S. CONROD	
DIAGRAM REVIEWED BY: .....		SCALE: NOT TO SCALE	
DATE: 08/2/2005		LOG NUMBER: .....	

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



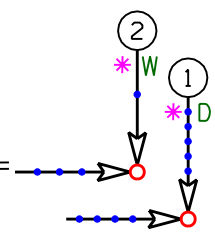
### LEGEND

	MOVING VEHICLE		WALK		9 MPH OR LESS	P	PEDESTRIAN
	PEDESTRIAN		WALKING		10 MPH TO 19	B	BICYCLE
	MOVING VEHICLE		DRIVING		20 MPH TO 29	T	TRAM
	MOVING VEHICLE		DRIVING		30 MPH TO 39	A	ANIMAL
	MOVING VEHICLE		DRIVING		40 MPH TO 49		
	MOVING VEHICLE		DRIVING		50 MPH TO 59		
	MOVING VEHICLE		DRIVING		60 MPH TO 69		
	MOVING VEHICLE		DRIVING		70 MPH TO 79		
	MOVING VEHICLE		DRIVING		80 MPH TO 89		
	MOVING VEHICLE		DRIVING		90 MPH TO 99		
	MOVING VEHICLE		DRIVING		100 MPH TO 109		
	MOVING VEHICLE		DRIVING		110 MPH TO 119		
	MOVING VEHICLE		DRIVING		120 MPH TO 129		
	MOVING VEHICLE		DRIVING		130 MPH TO 139		
	MOVING VEHICLE		DRIVING		140 MPH TO 149		
	MOVING VEHICLE		DRIVING		150 MPH TO 159		
	MOVING VEHICLE		DRIVING		160 MPH TO 169		
	MOVING VEHICLE		DRIVING		170 MPH TO 179		
	MOVING VEHICLE		DRIVING		180 MPH TO 189		
	MOVING VEHICLE		DRIVING		190 MPH TO 199		
	MOVING VEHICLE		DRIVING		200 MPH TO 209		
	MOVING VEHICLE		DRIVING		210 MPH TO 219		
	MOVING VEHICLE		DRIVING		220 MPH TO 229		
	MOVING VEHICLE		DRIVING		230 MPH TO 239		
	MOVING VEHICLE		DRIVING		240 MPH TO 249		
	MOVING VEHICLE		DRIVING		250 MPH TO 259		
	MOVING VEHICLE		DRIVING		260 MPH TO 269		
	MOVING VEHICLE		DRIVING		270 MPH TO 279		
	MOVING VEHICLE		DRIVING		280 MPH TO 289		
	MOVING VEHICLE		DRIVING		290 MPH TO 299		
	MOVING VEHICLE		DRIVING		300 MPH TO 309		
	MOVING VEHICLE		DRIVING		310 MPH TO 319		
	MOVING VEHICLE		DRIVING		320 MPH TO 329		
	MOVING VEHICLE		DRIVING		330 MPH TO 339		
	MOVING VEHICLE		DRIVING		340 MPH TO 349		
	MOVING VEHICLE		DRIVING		350 MPH TO 359		
	MOVING VEHICLE		DRIVING		360 MPH TO 369		
	MOVING VEHICLE		DRIVING		370 MPH TO 379		
	MOVING VEHICLE		DRIVING		380 MPH TO 389		
	MOVING VEHICLE		DRIVING		390 MPH TO 399		
	MOVING VEHICLE		DRIVING		400 MPH TO 409		
	MOVING VEHICLE		DRIVING		410 MPH TO 419		
	MOVING VEHICLE		DRIVING		420 MPH TO 429		
	MOVING VEHICLE		DRIVING		430 MPH TO 439		
	MOVING VEHICLE		DRIVING		440 MPH TO 449		
	MOVING VEHICLE		DRIVING		450 MPH TO 459		
	MOVING VEHICLE		DRIVING		460 MPH TO 469		
	MOVING VEHICLE		DRIVING		470 MPH TO 479		
	MOVING VEHICLE		DRIVING		480 MPH TO 489		
	MOVING VEHICLE		DRIVING		490 MPH TO 499		
	MOVING VEHICLE		DRIVING		500 MPH TO 509		
	MOVING VEHICLE		DRIVING		510 MPH TO 519		
	MOVING VEHICLE		DRIVING		520 MPH TO 529		
	MOVING VEHICLE		DRIVING		530 MPH TO 539		
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	MOVING VEHICLE		DRIVING		550 MPH TO 559		
	MOVING VEHICLE		DRIVING		560 MPH TO 569		
	MOVING VEHICLE		DRIVING		570 MPH TO 579		
	MOVING VEHICLE		DRIVING		580 MPH TO 589		
	MOVING VEHICLE		DRIVING		590 MPH TO 599		
	MOVING VEHICLE		DRIVING		600 MPH TO 609		
	MOVING VEHICLE		DRIVING		610 MPH TO 619		
	MOVING VEHICLE		DRIVING		620 MPH TO 629		
	MOVING VEHICLE		DRIVING		630 MPH TO 639		
	MOVING VEHICLE		DRIVING		640 MPH TO 649		
	MOVING VEHICLE		DRIVING		650 MPH TO 659		
	MOVING VEHICLE		DRIVING		660 MPH TO 669		
	MOVING VEHICLE		DRIVING		670 MPH TO 679		
	MOVING VEHICLE		DRIVING		680 MPH TO 689		
	MOVING VEHICLE		DRIVING		690 MPH TO 699		
	MOVING VEHICLE		DRIVING		700 MPH TO 709		
	MOVING VEHICLE		DRIVING		710 MPH TO 719		
	MOVING VEHICLE		DRIVING		720 MPH TO 729		
	MOVING VEHICLE		DRIVING		730 MPH TO 739		
	MOVING VEHICLE		DRIVING		740 MPH TO 749		
	MOVING VEHICLE		DRIVING		750 MPH TO 759		
	MOVING VEHICLE		DRIVING		760 MPH TO 769		
	MOVING VEHICLE		DRIVING		770 MPH TO 779		
	MOVING VEHICLE		DRIVING		780 MPH TO 789		
	MOVING VEHICLE		DRIVING		790 MPH TO 799		
	MOVING VEHICLE		DRIVING		800 MPH TO 809		
	MOVING VEHICLE		DRIVING		810 MPH TO 819		
	MOVING VEHICLE		DRIVING		820 MPH TO 829		
	MOVING VEHICLE		DRIVING		830 MPH TO 839		
	MOVING VEHICLE		DRIVING		840 MPH TO 849		
	MOVING VEHICLE		DRIVING		850 MPH TO 859		
	MOVING VEHICLE		DRIVING		860 MPH TO 869		
	MOVING VEHICLE		DRIVING		870 MPH TO 879		
	MOVING VEHICLE		DRIVING		880 MPH TO 889		
	MOVING VEHICLE		DRIVING		890 MPH TO 899		
	MOVING VEHICLE		DRIVING		900 MPH TO 909		
	MOVING VEHICLE		DRIVING		910 MPH TO 919		
	MOVING VEHICLE		DRIVING		920 MPH TO 929		
	MOVING VEHICLE		DRIVING		930 MPH TO 939		
	MOVING VEHICLE		DRIVING		940 MPH TO 949		
	MOVING VEHICLE		DRIVING		950 MPH TO 959		
	MOVING VEHICLE		DRIVING		960 MPH TO 969		
	MOVING VEHICLE		DRIVING		970 MPH TO 979		
	MOVING VEHICLE		DRIVING		980 MPH TO 989		
	MOVING VEHICLE		DRIVING		990 MPH TO 999		
	MOVING VEHICLE		DRIVING		1000 MPH TO 1009		

Treatment Site - TotalCrashes  
 After Period  
 February 1, 1999 - August 31, 2004  
 (5 years 6 months)  
 Johnston County

SR 2371 (OLD CORNWALLIS RD)  
 55 MPH

SR 2372 (EDWARDS RD)  
 55 MPH



<b>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</b>		<b>COLLISION DIAGRAM</b>	
<small>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</small>	<small>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</small>	Division: .....	Area: .....
		Study Period: 200999 TO 01/30/2009	
<small>SAFETY EVALUATION</small>		Distance: .....	T-Line: 150 FT
<small>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</small>		Analysis Prepared By: S. COMBOD	
<small>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</small>		Diagram Prepared By: S. COMBOD	
<small>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</small>		Diagram Reviewed By: .....	
<small>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</small>		Scale: NOT TO SCALE	
<small>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</small>		Date: 08/3/2005	
<small>TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT</small>		CC Number: .....	
<b>N.C. DEPARTMENT of TRANSPORTATION</b>			
<b>DIVISION of HIGHWAYS</b>			
<b>TRAFFIC ENGINEERING AND SAFETY</b>			
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