

Spot Safety Project Evaluation

Project Log # 200412107
Spot Safety Project # 04-97-216

**Spot Safety Project Evaluation, of the Flashing Traffic Signal Installation
At the Intersection of US 301 and SR 2141-Bizzell Grove Church Road-Oak Grove Inn Road
Near Micro, 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

Carrie L. Goodrich

4/12/2005

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-97-216 – The Intersection of US 301 and SR 2141-Bizzell Grove Church Road-Oak Grove Inn Road, near Micro, 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 and an Odds Ratio comparison analysis 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. Mr. Dwight Hinnant, Assistant Superintendent of Johnston Co. Public Schools, originally requested the improvements. Both US 301 and SR 2141-Bizzell Grove Church Road-Oak Grove Inn Road are two-lane facilities at the intersection. US 301 has a posted speed limit of 45 mph and SR 2141-Bizzell Grove Church Road-Oak Grove Inn Road has a posted speed of 55 mph in the vicinity of the intersection. The subject location is controlled by stop signs on SR 2141-Bizzell Grove Church Road-Oak Grove Inn Road. North Johnston High School is located just east of the intersection. In the 1980's raised islands were installed (in the quadrant containing Oak Grove Inn store) to provide channelization and prevent parking in the sight triangle.

The flashing traffic signal was installed to provide a safer intersection for motorists by better identifying the existing traffic control. It was felt that Angle and Left-Turn crashes occurred due to limited sight distance and increasing traffic volumes. The initial crash analysis for this location was completed from November 1, 1990 through October 31, 1996 with a total of 19 reported crashes. There were seven Angle Crashes, five Left-Turn Crashes, five Rear-end Crashes, and two Random Crashes. One fatality, three Class A injuries, five Class B injuries, and 17 Class C injuries resulted from these crashes. The final completion date for the improvement at the subject intersection was on February 12, 1998.

Before and After Analysis with Comparison Group

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 December 1, 1997 through April 30, 1998. The before period consisted of reported crashes from December 1, 1991 through November 30, 1997 (6 Years) and the after period consisted of reported crashes from May 1, 1998 through April 30, 2004 (6 Years). 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 of the intersections of US 301 at SR 2134-SR 2330-Hawkins Road-Browns Dairy Road, US 301 at SR 2136-SR 2330-Old Batten Road-Browns Dairy Road, and US 301 at SR 2137-Pittman Road-Davis Homestead 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 intersections. Please note that Angle and Left-Turn Crashes were the target crashes for the applied countermeasure.

Treatment Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	23	7	- 69.6
Total Severity Index	10.81	25.83	138.9
Angle/ Left-Turn Crashes	14	4	- 71.4
Angle/ Left-Turn Severity Index	15.00	42.60	184.0
Volume	4000	5800	45.0

Comparison Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	16	17	6.3
Total Severity Index	19.84	5.79	- 70.8
Angle/ Left-Turn Crashes	10	8	- 20.0
Angle/ Left-Turn Severity Index	27.44	6.55	- 76.1
Volume	3500	5200	48.6

Odds Ratio: Treatment versus Comparison

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Treatment Total Crashes	23	7	---
Comparison Total Crashes	16	17	- 71.4 %
Treatment Angle/ Left-Turn Crashes	14	4	---
Comparison Angle/ Left-Turn Crashes	10	8	- 64.3 %

The naive before and after analysis at the treatment location resulted in a 69.6 percent decrease in Total Crashes, a 138.9 percent increase in the Total Severity Index, and a 45 percent increase in Average Daily Traffic (ADT). The comparison locations experienced a 6.3 percent increase in Total Crashes, a 70.8 percent decrease in the Total Severity Index, and a 48.6 percent increase in ADT. The study used a before period ADT year of 1994 and an after period ADT year of 2001.

The Odds Ratio is used as another means of calculating the treatment effect. The number of crashes in the before and after period from the Comparison are used to calculate the percent reduction in crashes for the Treatment Intersection. As shown in the previous table, using the Odds Ratio calculation, there is a 71.4 percent decrease in Total Treatment Intersection crashes and a 64.3 percent decrease in Angle/ Left-Turn Treatment Intersection crashes.

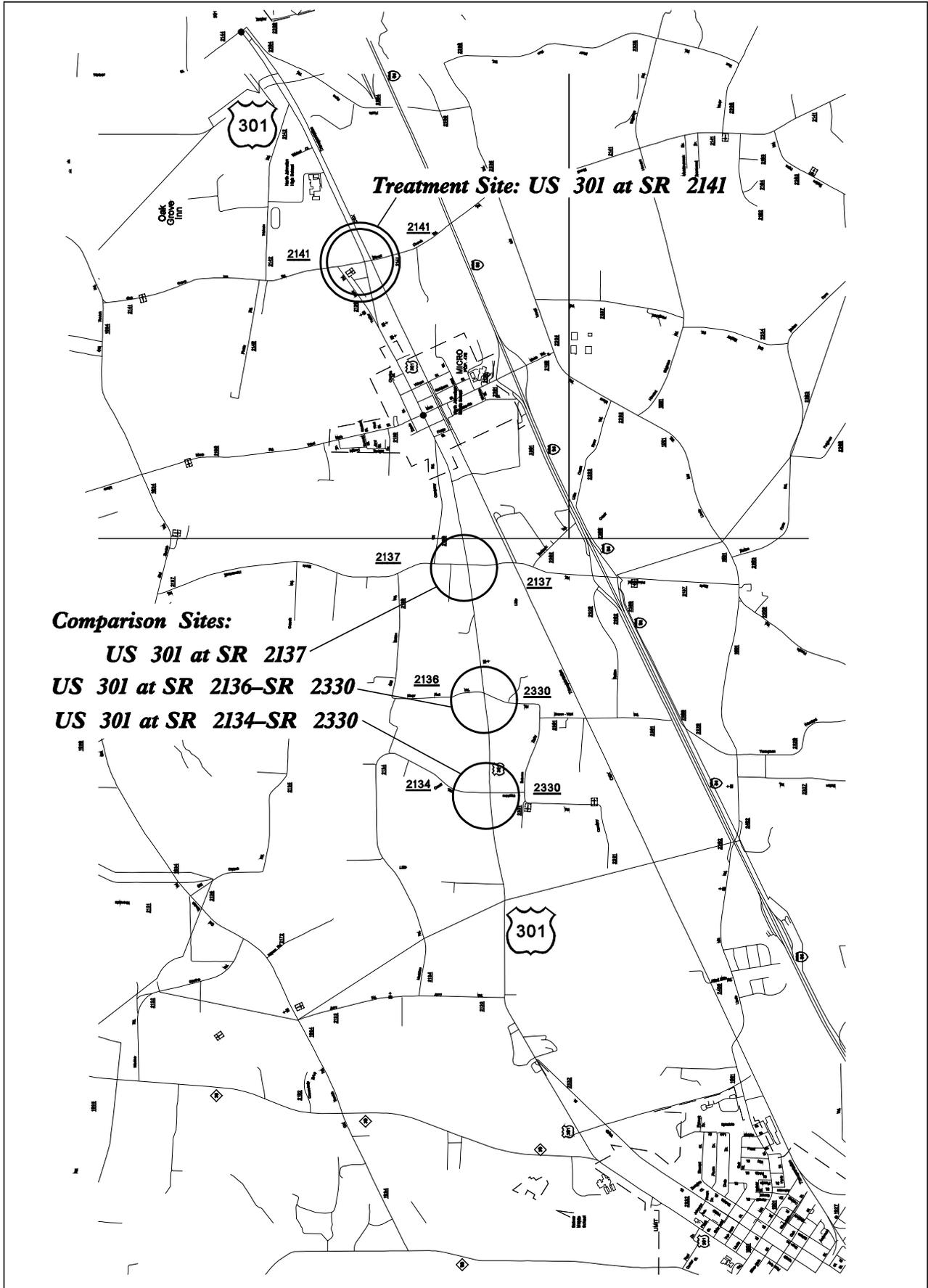
Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 69.6 percent decrease in Total Crashes and a 71.4 percent decrease in Angle/ Left-Turn Crashes. Using the Odds Ratio to calculate the treatment effect resulted in a 71.4 percent decrease in Total Crashes and a 64.3 percent decrease in Angle/ Left-Turn Crashes at the Treatment Intersection. The summary results demonstrate that the treatment location appears to have had a substantial decrease in the number of Total and Angle/ Left-Turn Crashes from the before to the after period using both analysis methods. The Total Severity Index increased by 138.9 percent, which is attributed to a fatal crash and four additional injury crashes in the after period.

The countermeasure crash reduction for Total Crashes at the subject intersection can be in the range of a 69.6 percent decrease to a 71.4 percent decrease in crashes. The countermeasure crash reduction for Angle/ Left-Turn Crashes at the subject intersection can be in the range of a 64.3 percent decrease to a 71.4 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.

Please see the attached Treatment Site Photos. Photos are provided for each leg of the intersection. Notice the Oak Grove Inn Store, a now abandoned convenience store located in the northeast quadrant of the intersection. The store closure possibly contributed to the reduction of crashes at the treatment intersection. Vehicles parked in the store parking lot potentially caused sight distance problems for motorists on southbound SR 2141. Also notice existing sight distance problems at the treatment intersection caused by signs and poles. The stop sign located on the southbound SR 2141 approach is not very visible to motorists because of trees/brush blocking the view.

Location Map, near Micro, Johnston County
Evaluation of Spot Safety Project Number 04-97-216



Treatment Site Photo (Taken on November 12, 2004)



Looking south on SR 2141-Bizzell Grove Church Road-Oak Grove Inn Road



Looking north on SR 2141-Bizzell Grove Church Road-Oak Grove Inn Road
Notice the abandoned *Oak Grove Inn Store* in the northeast quadrant of the intersection.

Treatment Site Photo (Taken on November 12, 2004)



Looking east on US 301



Looking west on US 301

Treatment Site Photo (Taken on November 12, 2004)



Notice the potential for sight distance problems caused by customers parked at store
(looking east on US 301 from southbound SR 2141)



Also notice this sight distance problem for motorists
(looking west on US 301 from southbound SR 2141)

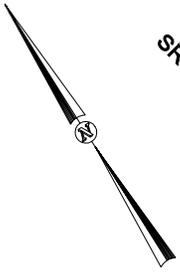
Treatment Site Photo (Taken on November 12, 2004)



Notice the sight distance problem for motorists caused by poles and signage (looking east on US 301 from northbound SR 2141)



The flashing signal reinforces the stop condition to motorist on the southbound SR 2141 approach. As shown in the photo above, the stop sign is not very visible to approaching vehicles.



SR 2141-OAK GROVE INN RD
55 MPH



TREATMENT SITE-TOTAL CRASHES-BEFORE PERIOD
(DECEMBER 1, 1991 THROUGH NOVEMBER 30, 1997 - 6 YEARS)

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		ANIMAL
	PEDESTRIAN		TURNING		10 MPH TO 19		PEDESTRIAN
	PARKED VEHICLE		BACKING		20 MPH TO 29		TRAIN
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRIVER AT FAULT
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		DRY
	HEAD ON		INJURY		50 MPH TO 59		WET
	REAR END		FATALITY		60 MPH TO 69		ICY OR SLUSHY
	RAN OFF ROAD		SPEED UNKNOWN		TO AND UP		ICY OR SLUSHY
					70 MPH TO 79		OLEF

US 301
45 MPH



SR 2141-BIZELL GROVE CHURCH RD
55 MPH

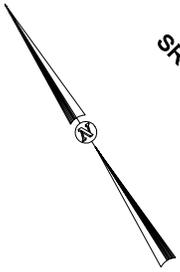
CSX RR X-ING

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION 3	AREA 1
STUDY PERIOD: 12/1/91-11/30/97	
DISTANCE: 1/4-MILE - 50FT	
ANALYSIS PREPARED BY: C. GOODRICH	
DIAGRAM PREPARED BY: C. GOODRICH	
DATE: NOV 30, 2004	
LOG NUMBER:	

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



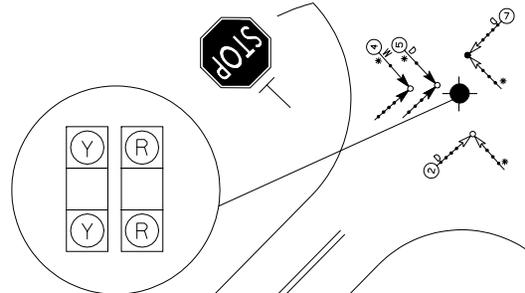
SR 2141-OAK GROVE INN RD
55 MPH



TREATMENT SITE-TOTAL CRASHES-AFTER PERIOD
(MAY 1, 1998 THROUGH APRIL 30, 2004 - 6 YEARS)

LEGEND

MOVING VEHICLE	ANGLE	9 MPH OR LESS	ANIMAL
PEDESTRIAN	TURNING	10 MPH TO 19	PEDESTRIAN
PARKING VEHICLE	BACKING	20 MPH TO 29	TRAIN
FIXED OBJECT	SIDESWIPE	30 MPH TO 39	DRIVER AT FAULT
HEAD ON	OUT OF CONTROL	40 MPH TO 49	WET
REAR END	INJURY	50 MPH TO 59	ICY OR SLUSHY
RAN OFF ROAD	FATALITY	60 MPH TO 69	OILY
		TO AND UP	
		SPEED UNKNOWN	



US 301
45 MPH



SR 2141-BIZZELL GROVE CHURCH RD
55 MPH

CSX RR X-ING

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION 3	AREA 1
STUDY PERIOD: 5/1/98-4/30/04	
DISTANCE: 1/4-MILE - 50FT	
ANALYSIS PREPARED BY: C. GOODRICH	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: C. GOODRICH	
DIAGRAM REVIEWED BY:	
SS 04-97-26 AFTER PERIOD	SCALE: NOT TO SCALE
LOG NUMBER:	DATE: NOV 30, 2004

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DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH