

# Spot Safety Project Evaluation

Order # 41000015263

Spot Safety Project # 12-01-235

**Spot Safety Project Evaluation of the Traffic Signal Installation  
SR 2000 (Hickory Grove Rd) at SR 1924 (Kelly Rd)  
Gaston County**

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
Transportation Mobility and Safety Division  
North Carolina Department of Transportation

**Principal Investigator**



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Jason B. Schronce

11-16-2011

Date

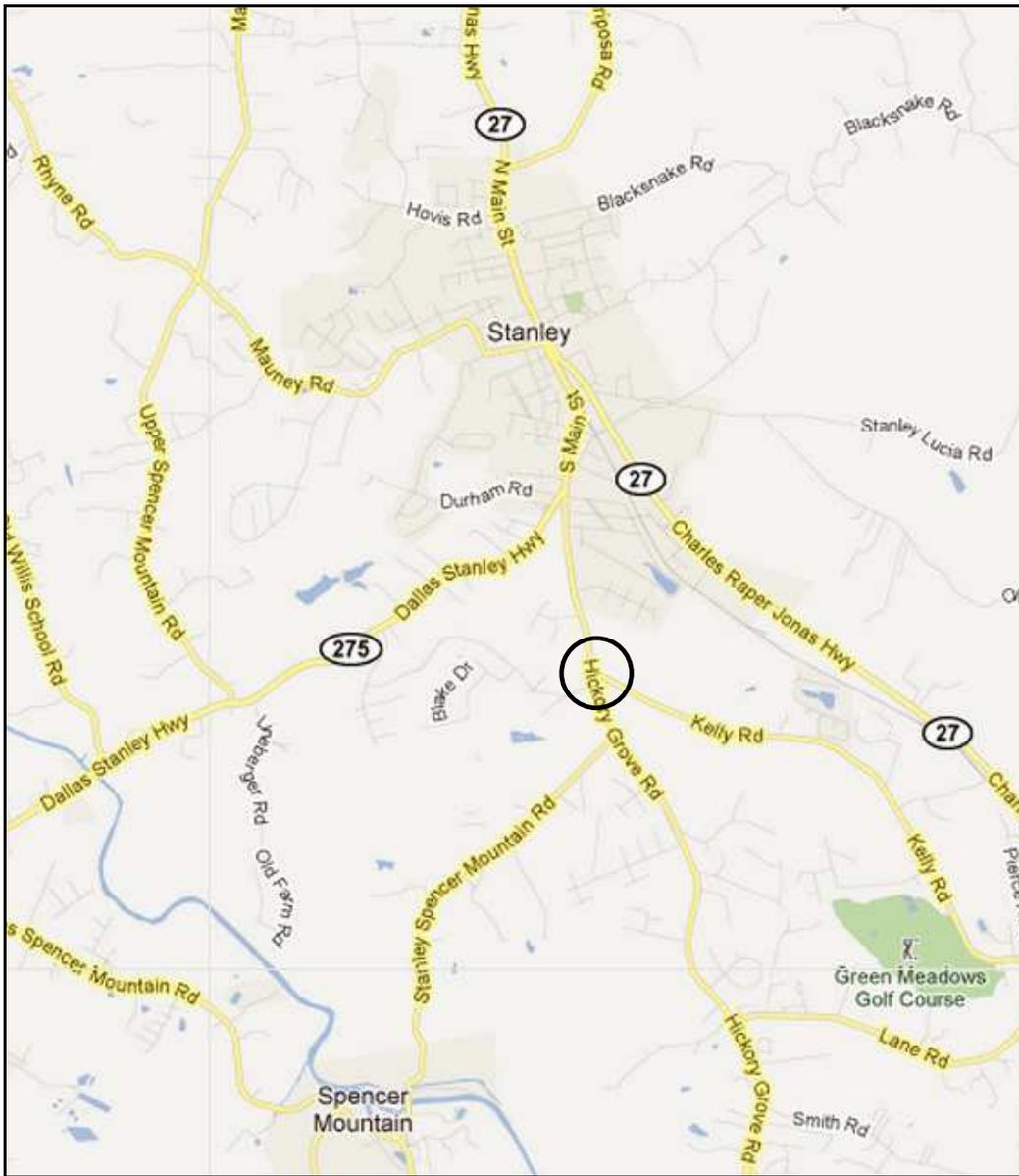
Traffic Safety Project Engineer

## *Spot Safety Project Evaluation Documentation*

### **Subject Location**

Evaluation of Spot Safety Project Number 12-01-235 located at the Intersection of SR 2000 (Hickory Grove Road) and SR 1924 (Kelly Road / Westland Farm Road) in Gaston County, near the City of Stanley.

The Sig ID is 12-1707 for the newly install permissive traffic signal.





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

The spot safety project improvement countermeasure chosen for the subject location was the installation of an intersection traffic signal. SR 2000 (Hickory Grove Road) and SR 1924 are both two-lane facilities at the subject intersection with speed limits of 45 mph on all approaches. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 1924 (Kelly Rd) in the before period.

The original statement of problem articulated concern that side street motorists were experiencing delay entering the intersection. This location was not a safety concern but met Signal Warrant 2.

The initial crash analysis was completed from June 1, 1998 to May 31, 2001 with seven (7) reported crashes, one (1) of which was deemed correctable. The final completion date for the improvement at the subject intersection was on May 31, 2007 with a total cost of \$43,000.

## 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 were the months of March through May 2007. The before period consisted of reported crashes from December 1, 2002 through February 28, 2007 (4 years and 3 months); and the after period consisted of reported crashes from June 1, 2007 through August 31, 2011 (4 years and 3 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map, aerial map, and photos for further details.*

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.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	7	5	- 28.6 %
Total Severity Index	4.17	3.96	- 5.0 %
Target Crashes	4	1	- 75.0 %
Target Crash Severity Index	6.55	1.00	- 84.7 %
Volume (2005, 2009)	11,500	11,600	0.9 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	1	0	- 100.0 %
Class C Injury Crashes	2	2	0.0 %
Total Injury Crashes	3	2	- 33.3 %

The naive before and after analysis at the treatment location resulted in a 29 percent decrease in Total Crashes, a 75 percent decrease in Target Crashes, and a 5 percent decrease in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2009.

## Results and Discussion

Referencing the *Collision Diagrams*, the before period presented a small pattern of three (3) left turn crashes from vehicles on the side street choosing the insufficient gap. Also, there was one (1) left turn same road on Hickory Grove Road and one (1) vehicle that ran through the 3-leg intersection.

After the signal installation, the left turn pattern was reduced to one (1) crash caused by a northbound SR 2000 vehicle that ran the red light. However, there appears to be a small pattern of three (3) rear-end collisions on the southbound approach of Hickory Grove Road.

The calculated benefit to cost ratio for this project is **0.61 considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.52**. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided from our Field Visit on October 31<sup>st</sup>, 2011 for all three approaches to the treatment intersection. 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.

#### **Treatment Site Photos (Field Visit 10-31-2011)**



**Travelling Northbound on SR 2000 (Hickory Grove Road)**



**Travelling Southbound on SR 2000 (Hickory Grove Road)**



**Travelling Westbound on SR 1924 (Kelly Road)**

**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: SR 2000 at SR 1924		BY: JBS							
COUNTY: Gaston		DATE: 11/3/2011							
FILE NO.: SS 12-01-235									
DETAILED COST:	TYPE IMPROVEMENT - <b>New Traffic Signal</b>								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$43,000	10	0.149	\$6,408				
	Right-of-Way	\$0	0	0.000	\$0				
		\$0	0	0.000	\$0				
	TOTALS	\$43,000	10	0.149	\$6,408				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
	TOTAL ANNUAL COST=				\$9,308				
	TOTAL COST OF PROJECT=				\$43,000				
COMPREHENSIVE COST REDUCTION:									
ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES									
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS	
BEFORE	4.25	0	0.00	3	0.71	4	0.94	\$18,165	
AFTER	4.25	0	0.00	2	0.47	3	0.71	\$12,447	
								Annual Benefits from Crash Cost Savings	\$5,718
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$3,591)			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.61			
TOTAL COST OF PROJECT		-	\$43,000	COMPREHENSIVE B/C RATIO		-	0.61		

**BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes**

LOCATION: SR 2000 at SR 1924		BY: JBS							
COUNTY: Gaston		DATE: 11/3/2011							
FILE NO.: SS 12-01-235		Target - Frontal Impact Crashes							
DETAILED COST:	TYPE IMPROVEMENT - <b>New Traffic Signal</b>								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$43,000	10	0.149	\$6,408				
	Right-of-Way	\$0	0	0.000	\$0				
		\$0	0	0.000	\$0				
	TOTALS	\$43,000	10	0.149	\$6,408				
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000				
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
	TOTAL ANNUAL COST=				\$9,308				
	TOTAL COST OF PROJECT=				\$43,000				
COMPREHENSIVE COST REDUCTION:									
ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES									
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS	
BEFORE	4.25	0	0.00	3	0.71	1	0.24	\$15,129	
AFTER	4.25	0	0.00	0	0.00	1	0.24	\$1,012	
								Annual Benefits from Crash Cost Savings	\$14,118
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$4,809			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	1.52			
TOTAL COST OF PROJECT		-	\$43,000	COMPREHENSIVE B/C RATIO		-	1.52		



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
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		REAR END		50 MPH TO 59		ICE OR SNOW
	RAN OFF ROAD		REAR END		60 MPH TO 69		TO AND UP
			REAR END		70 MPH OR MORE		SPEED UNKNOWN
			REAR END		FATALITY		ONLY

SS# 12-01-235  
 Order# 41000015263  
 Gaston County  
 AFTER Period  
 6/1/07 - 8/31/11  
 4.25 Years

New Signalized  
 Intersection  
 Sig ID 12-1707  
 (All Permissive)

Frontal Impact  
 Target Crashes

**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRANSPORTATION MOBILITY and SAFETY DIVISION**

**TRAFFIC SAFETY UNIT**

Date: 10-26-2011 Prepared By: J. Schronce

