

Spot Safety Project Evaluation

Project Log # 200704313

Spot Safety Project # 04-00-256

**Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of NC 111 (Patetown Rd) and SR 1571 (Tommys Rd)
City of Goldsboro, Wayne County**

Documents Prepared By:

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

Principal Investigator



Jason B. Schronce

12-1-2008

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-00-256 located at the Intersection of NC 111 (Patetown Rd) and SR 1571 (Tommys Rd) in Wayne County outside the City of Goldsboro.

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 2-phase, actuated traffic signal. In the study period, NC 111 and SR 1571 are both two-lane facilities at the subject intersection with no turn lanes and speed limits of 45 mph and 55 mph, respectively. The subject location is a crossroads type intersection, which was initially controlled by dual stop signs and concrete channelization islands on SR 1571 (Tommys Rd). In January of 1998, a standard overhead flasher was installed as the first countermeasure targeting angle collisions under Spot Safety Project 04-95-268.

The original statement of problem was the high crash rating and rising vicinity traffic volume. Crash Warrant Number 6 was met explicitly and this intersection was listed as the 87th worst intersection in the state on the 2000 Spring Revision of the Highway Safety Improvement Program.

The initial crash analysis was completed from June 1, 1997 to June 1, 2000 with twenty (20) reported crashes, thirteen (13) of which were deemed correctable with the signal installation. The final completion date for the improvement at the subject intersection was on May 14, 2002 with a total cost of \$40,000.00.

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 March 1, 2002 to July 31, 2002. The before period consisted of reported crashes from March 1, 1998 through February 28, 2002 (4 years); and the after period consisted of reported crashes from August 1, 2002 through July 31, 2006 (4 years). The ending date for this analysis was limited by the installation of the flasher in January of 1998.

The congruent time period before the installation of the flasher was also analyzed with reported crashes from November 1, 1993 and October 31, 1997 (4 years). This group is referred to as "Stop Control" in Table 2 below. This table shows the progression of countermeasures used at this location and their effectiveness.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location 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.

Treatment Information (Table 1)			
	Before (Flasher)	After (Signal)	Percent Reduction (-) Percent Increase (+)
Total crashes	22	19	- 13.64 %
Total Severity Index	8.82	7.33	- 16.89 %
Target Crashes	16	11	- 31.25 %
Target Crash Severity Index	11.75	10.58	- 9.96 %
Volume	9,840	11,420	16.06 %
Injury Crash Summary			
Fatal injury Crashes	0	1	100.00 %
Class A injury Crashes	1	0	- 100.00 %
Class B injury Crashes	3	1	- 66.67 %
Class C Injury Crashes	10	5	- 50.00 %
Total Injury Crashes	14	7	- 50.00 %

Treatment Progression (4 years each) (Table 2)			
	Stop Control	Stop Control with Flasher	Signal Control
Total crashes	29	22	19
Total Severity Index	12.41	8.82	7.33
Target crashes	24	16	11
Target Severity Index	13.87	11.75	10.58

The naive before and after analysis at the treatment location from the flasher to the signal resulted in a 13.6 percent decrease in Total Crashes, a 31 percent decrease in Target Crashes, and a 10 percent decrease in the Total Severity Index. The before period ADT year was 2000 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 13.6 percent decrease in Total Crashes and a 31 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period. The naïve study of countermeasure progression at this location, in Table 2, also shows

gradual improvement in both numbers of Total Crashes, Target Crashes, and Severity Index over the complete study period.

Table 2 illustrates the use of multiple countermeasures at one location. The greatest improvement at the intersection is observed with the installation of the flasher. Target Crash Severity was reduced by 15 percent with the flasher installation and 10 percent with the traffic signal. Crashes and the corresponding severity have been gradually reduced by the application of each advanced countermeasure.

Referencing the *Collision Diagrams (before period flasher and after period)*, a large portion of crashes at the intersection in the before period (15 of 22) were the result of a vehicle entering or crossing NC 111 from SR 1571 in an unsafe manner. This pattern is evident involving vehicles traveling both directions on SR 1571. After the signal installation, this pattern is translated to vehicles that are running the red indication signal. Seven (7) collisions occurred in the after period from vehicles running the red light, including one fatal. There were also three (3) collisions caused by illegal passing maneuvers in the intersection during the after period.

The calculated benefit to cost ratio for signal installation is 3.11 considering total crashes. The benefit to cost ratio considering only target crashes is 4.13. 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.

The after period fatal collision occurred in June of 2005. The Regional Traffic Engineer requested alterations for safety at this intersection following the fatal investigation report. The Division confirmed retracing the stop bars on both approaches of SR 1571 in August of 2005 and the Advanced Detection Loops were removed from the Tommys Road approaches in September of 2005 after being reviewed by the Signal Supervisor.

Since the additional signal-phasing countermeasure was installed during the after period, the signal data was examined to quantify the results. The signal was analyzed with advanced detection loops from August 1, 2002 through July 31, 2005 (3 years) and without advanced detection loops from August 1, 2005 through April 30, 2007. The ending date for this analysis was determined by the available crash data at the time of analysis. *Table 3* below displays the results.

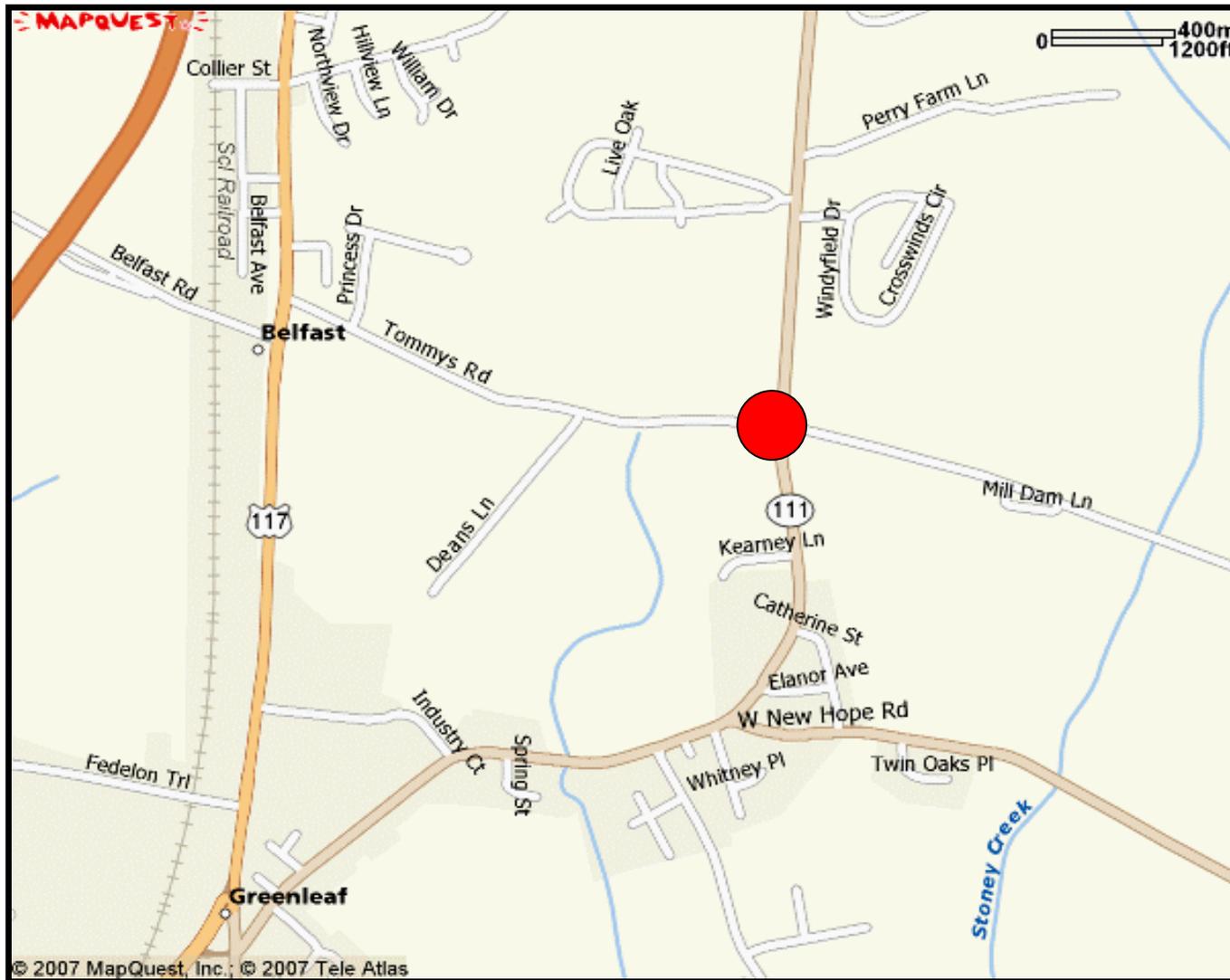
After Period Crashes (Table 3)		
	With Advanced Detection (3 yrs)	Advanced Detection Removed (1.75 yrs)
Total crashes	10	11
Total Crashes per year	3.33	6.29
Total Severity Index	10.80	3.69
<hr/>		
Target Crashes	8	5
Target crashes per year	2.67	2.86
Target Severity Index	10.60	1.80
<hr/>		
Red Light Running	6	2

From the table above, Total Crashes per year appear to have doubled once the advanced detection loops were removed. However, the significant positive results achieved in the Target Severity Index, from 10.60 to 1.80, justify the phasing loop removal. The Safety Evaluation Group plans to monitor the signal at this location for the remainder of the 3-year after period from the latest countermeasure implementation.

Please see the attached *Treatment Site Photos*. Photos are provided for all 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.

**Location Map
Wayne County
Evaluation of Spot Safety Project # 04-00-256**



Treatment Location: NC 111 (Patetown Road) at SR 1571 (Tommys Road) in Goldsboro

TREATMENT SITE PHOTO TAKEN 5/30/2007



Traveling North on NC 111 (Patetown Rd) – limited sight distance due to curve



Traveling North on NC 111 (Patetown Rd)



Traveling South on NC 111



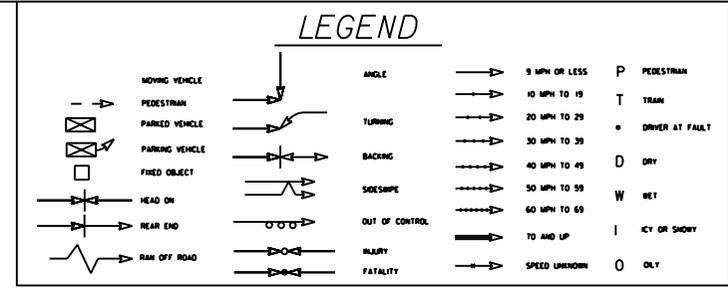
Traveling West on SR 1571 (Tommys Rd)



Traveling East on SR 1571 (Tommys Rd)

NC III
Patetown Road
45 MPH

SR 1571
Tommys Road
55 MPH



SS# 04-00-256
Wayne County
Before Period
Stop Control Only
11/1/93 - 10/31/97
NC III at SR 1571

Crash 13 and 24: Vehicles crashed while avoiding an angle collision

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 4	AREA:
STUDY PERIOD: 8/1/1993 TO 10/31/1997	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: DR	
DIAGRAM PREPARED BY: ST	
DIAGRAM REVIEWED BY: JBS	
SCALE: NOT TO SCALE	
DATE: 8-8-2007	
LOG NUMBER: SS# 04-00-256	

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

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		T TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		D DRIVER AT FAULT
	FIXED OBJECT		SIDESWIPE		30 MPH TO 39		D DRY
	HEAD ON		OUT OF CONTROL		40 MPH TO 49		W WET
	REAR END		INJURY		50 MPH TO 59		I ICE OR SNOW
	RAN OFF ROAD		FATALITY		60 MPH TO 69		O ONLY
			TO AND UP		SPEED UNKNOWN		

NC III
Patetown Road
45 MPH

Crash 4: Driver collided with a stationary vehicle involved in Crash 3

Crash 13: Tractor trailer jackknifed to avoid a turning vehicle and crossed center line

SS# 04-00-256
Wayne County
Before Period
Stop Control w/ Flasher
3/1/98 - 2/28/02
NC III at SR 1571

SR 1571
Tommys Road
55 MPH

Target Crashes

Y
Y
NC III
Approaches

R
R
SR 1571
Approaches

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 4	AREA: _____
	STUDY PERIOD: 3/1/1998 TO 2/28/2002	
	DISTANCE: 1+LINE + 150FT	
	ANALYSIS PREPARED BY: .JBS	
	ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: ST		DIAGRAM REVIEWED BY: .JBS
SCALE: NOT TO SCALE		
DATE: 5-22-2007		
LOG NUMBER: SS* 04-00-256		

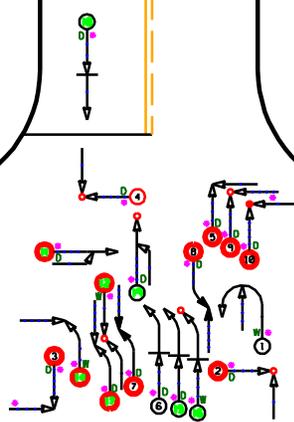
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SYSTEMS BRANCH



SR 1571
Tommys Road
55 MPH

NC III
Patetown Road
45 MPH

Crashes 2, 3, 4, 5, 9, 10, and 14
resulted from vehicles running
red indication light



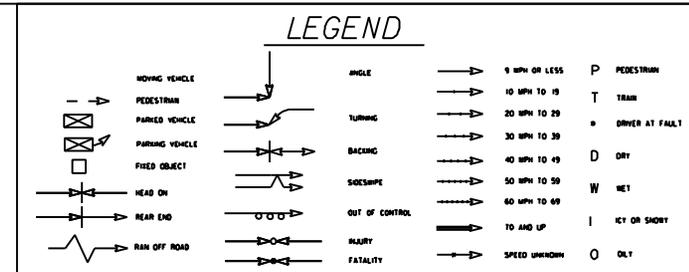
New
Signalized
Intersection



Crashes 11, 12, and 19
resulted from vehicles making
an illegal passing movement



Crashes 11-19: Occurred after Stop Bars
retraced in Aug 2005 and Advanced
Detection Loops removed in
September 2005 (These crashes
represent 1 year of the 4 year
after period)



SS# 04-00-256
Wayne County
After Period
Signal Control
8/1/02 - 7/31/06
NC III at SR 1571



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

		COLLISION DIAGRAM DIVISION 4 AREA: STUDY PERIOD: 8/1/2002 TO 7/31/2006 DISTANCE: 1.14 MI + 60 FT ANALYSIS PREPARED BY: JES ANALYSIS CHECKED BY: BP DIAGRAM PREPARED BY: ST DIAGRAM REVIEWED BY: JES
		SCALE: NOT TO SCALE DATE: 5-22-2007 LOG NUMBER: 55P-04-00-256
N.C. DEPARTMENT of TRANSPORTATION DIVISION of HIGHWAYS TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH		