

Spot Safety Project Evaluation

Order # 41000008927

Spot Safety Project # 08-99-216

**Spot Safety Project Evaluation of the
Signal and Turn Lane Installations
NC 5 and SR 1103 (Sand Pit Road)
Moore County**

Documents Prepared By:

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

Principal Investigator



Jason B. Schronce

11-4-2010

Date

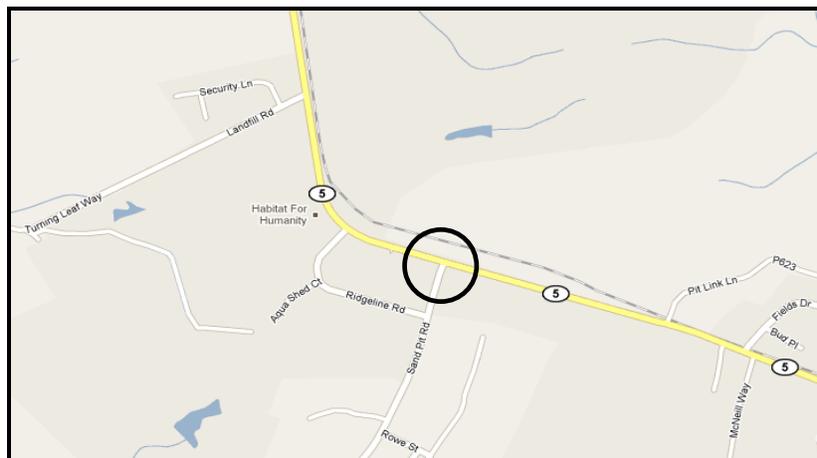
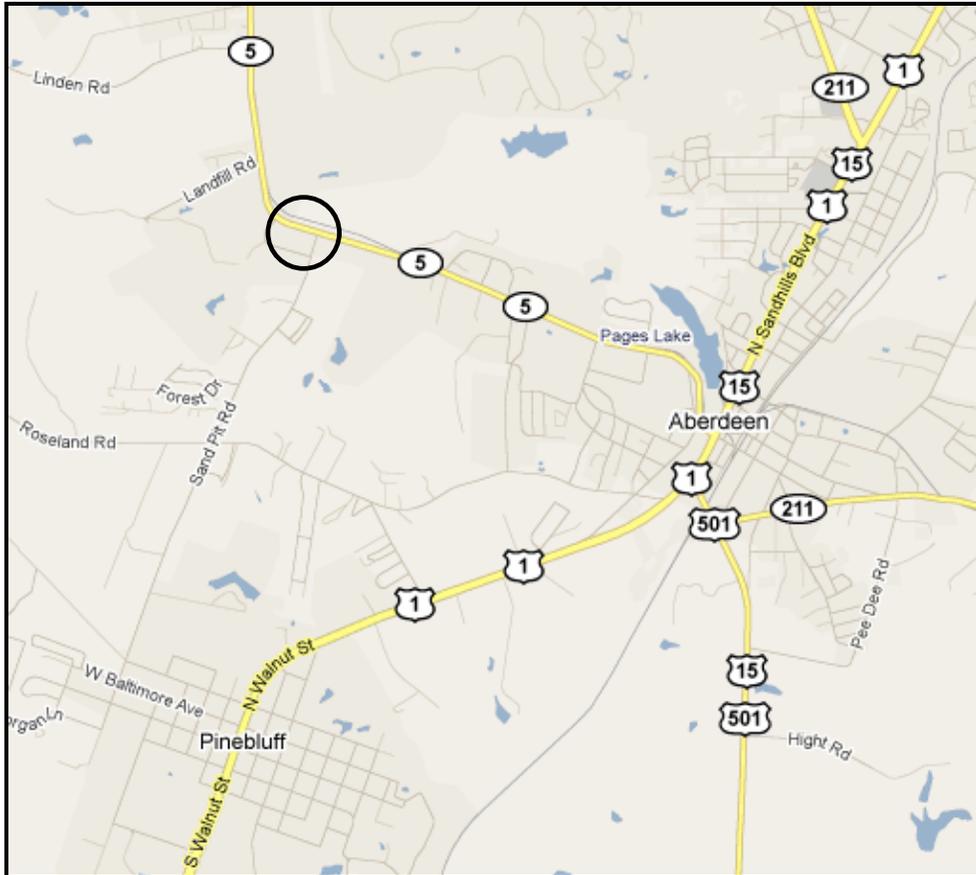
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-99-216 located at the Intersection of NC 5 and SR 1103 (Sand Pit Road) in Moore County, west of the City of Aberdeen.

The Sig ID is 08-1021 for this newly installed traffic signal.





Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation of an intersection 2-phase traffic signal and turn lanes on the three approaches. NC 5 was widened to include a westbound left turn lane and an eastbound right turn lane; while SR 1103 now has separate left and right turn lanes. NC 5 and SR 1103 were both two-lane facilities in the before period 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 1103 (Sand Pit Rd).

The original statement of problem was the existence of westbound rear-end and left turn crashes related to the lack of storage for westbound NC 5 left turning vehicles. The intended purposes of these improvements were to alleviate crashes and improve intersection mobility.

The initial crash analysis was completed from April 1, 1996 to March 31, 1999 with eight (8) reported crashes, four (4) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on September 26, 2006 with a total cost of \$150,000.

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 July through October 2006. The before period consisted of reported crashes from September 1, 2002 through June 30, 2006 (3 years and 10 months); and the after period consisted of reported crashes from November 1, 2006 through August 31, 2010 (3 years and 10 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 Traffic Signal countermeasure and Westbound NC 5 Rear-End Crashes were the targets for the left turn lane installation. 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	6	2	- 66.7 %
Total Severity Index	5.93	4.70	- 20.7 %
Frontal Impact Target Crashes	2	2	0.0 %
Frontal Target Crash Severity Index	4.70	4.70	0.0 %
WB Rear-End Target Crashes	2	0	- 100.0 %
Rear-End Target Crash Severity Index	8.40	0.00	- 100.0 %
Volume (2004, 2008)	14,300	13,100	- 8.4 %

<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	1	0.0 %
Class C Injury Crashes	3	1	- 66.7 %
Total Injury Crashes	4	1	- 75.0 %

The naive before and after analysis at the treatment location resulted in a 67 percent decrease in Total Crashes, a 100 percent decrease in Rear-End Target Crashes, and a 21 percent decrease in the Total Severity Index. The before period ADT year was 2004 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented two small crash patterns. The westbound NC 5 approach showed two (2) rear-end crashes; one while waiting to turn left and one in the traffic queue. The before period intersection also had two (2) left turn different roadway crashes from vehicles on SR 1103 choosing insufficient gaps from the stop sign. After the turn lane installations on all approaches the rear-end crashes at this location were eliminated. There were two (2) frontal impact crashes in the after period; an eastbound NC 5 motorist running the red light and one permissive green left turn crash. Overall, this intersection experienced crash reduction through the analysis.

The calculated benefit to cost ratio for this project is **0.63 considering total crashes**. The benefit to cost ratio **considering only combined target crashes is 0.39**. 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 Google Street View 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



Traveling West on NC 5 approaching signal



Looking East on NC 5 at intersection with SR 1103



Traveling North on SR 1103 (Sand Pit Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 5 at SR 1103		BY: JBS						
COUNTY: Moore		DATE: 11/3/2010						
FILE NO.: SS 08-99-216								
DETAILED COST:	TYPE IMPROVEMENT - Traffic Signal & Turn Lanes							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$150,000	10	0.149	\$22,354				
	\$0	0	0.000	\$0				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$150,000	10	0.149	\$22,354				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,200				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$26,454				
TOTAL COST OF PROJECT=				\$150,000				
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	3.83	0	0.00	4	1.04	2	0.52	\$23,133
AFTER	3.83	0	0.00	1	0.26	1	0.26	\$6,345
Annual Benefits from Crash Cost Savings								\$16,789
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$9,666)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.63		
TOTAL COST OF PROJECT		-	\$150,000	COMPREHENSIVE B/C RATIO		-	0.63	

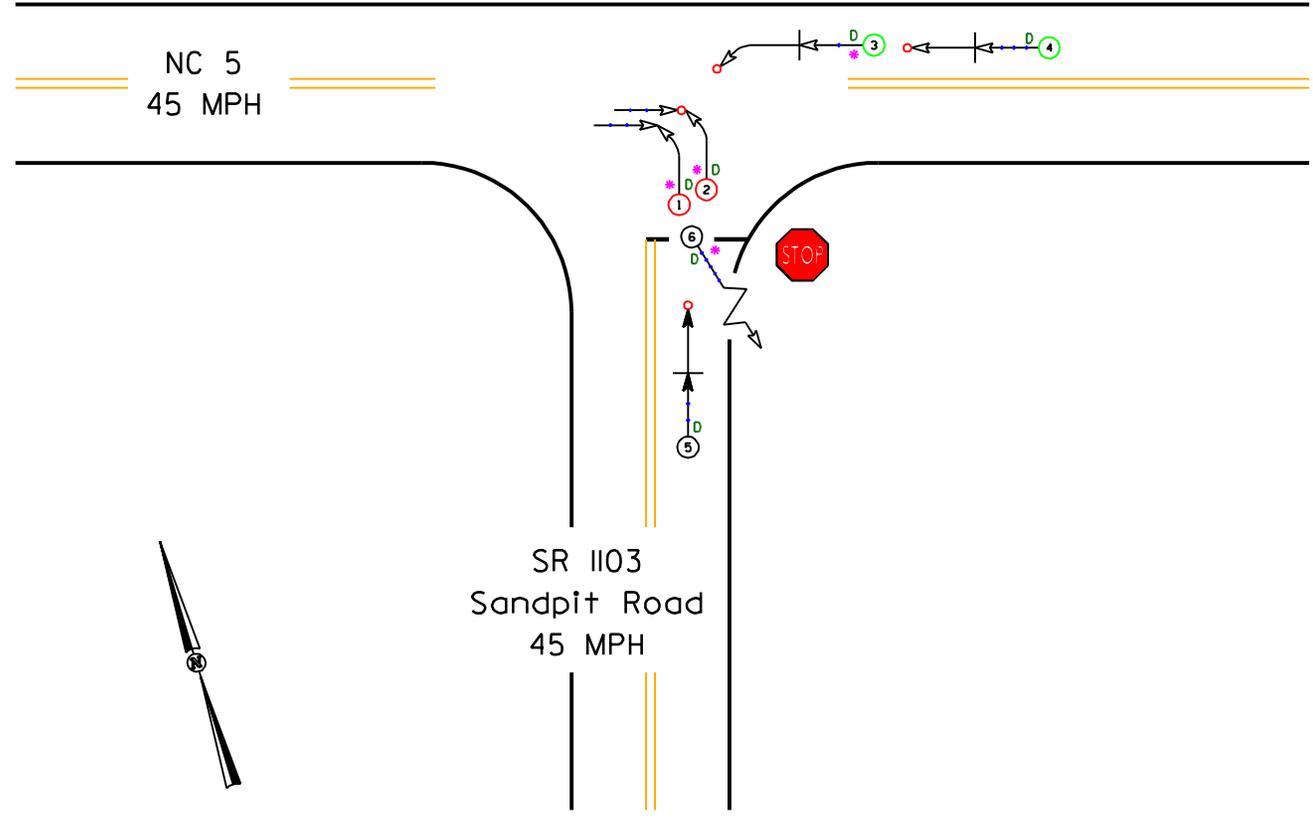
BENEFIT-COST ANALYSIS WORKSHEET - Combined Target Crashes

LOCATION: NC 5 at SR 1103		BY: JBS						
COUNTY: Moore		DATE: 11/3/2010						
FILE NO.: SS 08-99-216								
DETAILED COST:	TYPE IMPROVEMENT - Traffic Signal & Turn Lanes							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$150,000	10	0.149	\$22,354				
	\$0	0	0.000	\$0				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$150,000	10	0.149	\$22,354				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,200				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$26,454				
TOTAL COST OF PROJECT=				\$150,000				
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	3.83	0	0.00	3	0.78	1	0.26	\$16,789
AFTER	3.83	0	0.00	1	0.26	1	0.26	\$6,345
Annual Benefits from Crash Cost Savings								\$10,444
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$16,011)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.39		
TOTAL COST OF PROJECT		-	\$150,000	COMPREHENSIVE B/C RATIO		-	0.39	

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED 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		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		10 AND UP
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		ONLY

SS# 08-99-216
 Order# 41000008927
 Moore County
 BEFORE Period
 9/1/02 - 6/30/06



Traffic Signal
Target Crashes

Turn Lane
Target Crashes

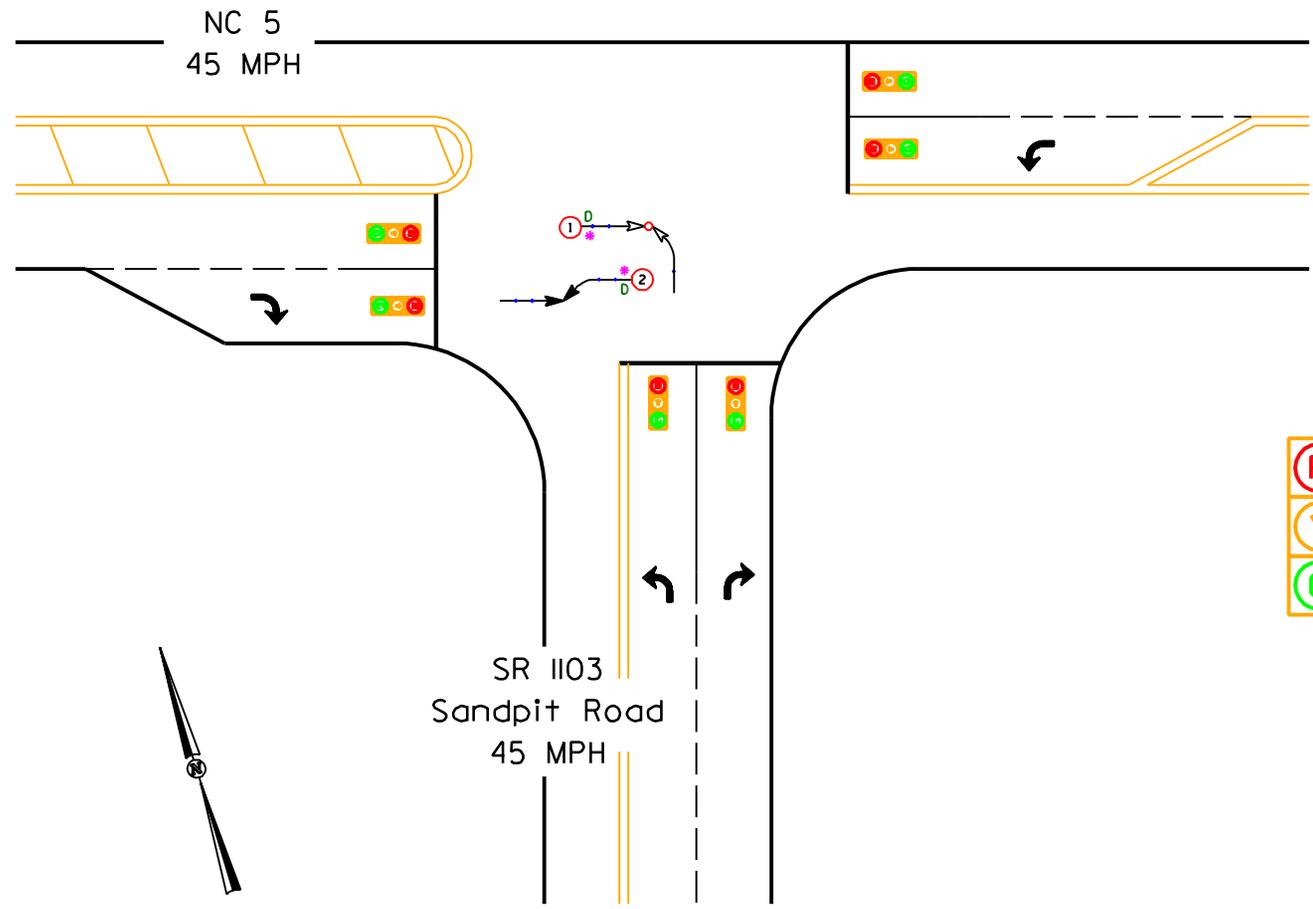
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION

TRAFFIC SAFETY UNIT

<i>Date: 11-1-2010</i>	<i>Prepared By: J. Schronce</i>
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LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED 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		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		TO AND LP
	RAN OFF ROAD		SPEED UNKNOWN		70 AND LP		ONLY

SS# 08-99-216
 Order# 41000008927
 Moore County
 AFTER Period
 11/1/06 - 8/31/10



New Signalized
 Intersection
 Sig ID 08-1021

- Traffic Signal Target Crashes
- Turn Lane Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 11-1-2010 Prepared By: J. Schronce