

Spot Safety Project Evaluation

Order # 41000004121

Spot Safety Project # 08-02-207

**Spot Safety Project Evaluation of the Traffic Signal Installation
SR 1105 (Turnpike Road) at SR 1117 (Blues Farm Road)
City of Laurinburg, Scotland 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

2-4-2010

Date

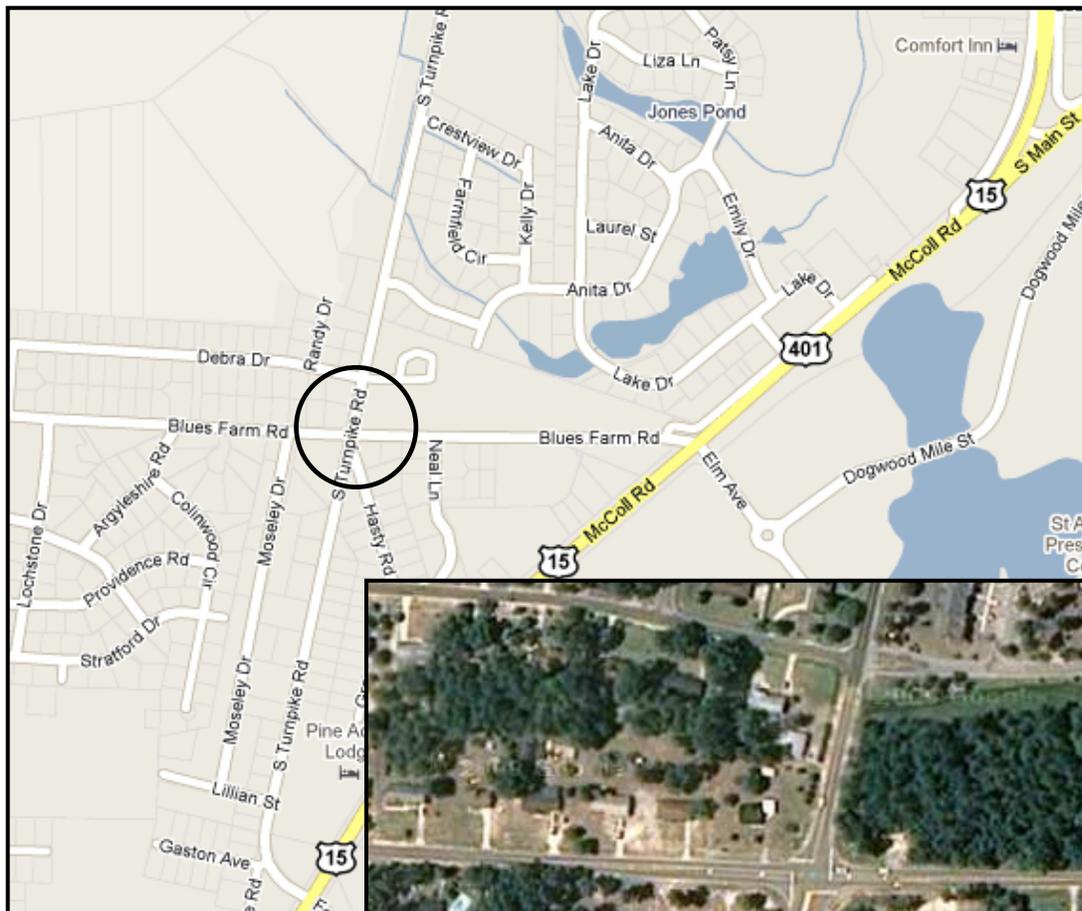
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-02-207 located at the Intersection of SR 1105 (Turnpike Road) and SR 1117 (Blues Farm Road) in Scotland County, City of Laurinburg. The intersection of SR 1105 (Turnpike Rd) and SR 1615 (Hasty Rd) is also located within the evaluation study limits.

The Sig ID is 08-0324 for this newly installed 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 (Sig ID 08-0324). With the installation of the signal, left turn lanes were also installed on the SR 1117 (Blues Farm Rd) approaches. SR 1105, SR 1117, and SR 1615 (Hasty Rd) are all two-lane roadways with speed limits of 45 mph. The subject location is a four-leg crossroads intersection, which was controlled by dual posted stop signs on SR 1105 (Turnpike Rd). The intersection of SR 1615 remained under stop sign control with the signal installation.

The original statement of problem was the high number of angle collisions involving vehicles attempting to cross SR 1117 (Blues Farm Rd) on SR 1105 (Turnpike Rd). The intended purpose of this countermeasure was to alleviate the existing crash patterns.

The initial crash analysis was completed from January 1, 1999 to January 1, 2002 with thirteen (13) reported crashes, all of which were deemed correctable angle collisions. The final completion date for the improvement at the subject intersection was on July 7, 2004 with a total cost of \$180,000.

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 was the months of June through July 2004. The before period consisted of reported crashes from February 1, 1999 through May 31, 2004 (5 years and 4 months); and the after period consisted of reported crashes from August 1, 2004 through November 30, 2009 (5 years and 4 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	27	3	- 88.9 %
Total Severity Index	7.92	3.47	- 56.2 %
Target Crashes	26	3	- 88.5 %
Target Crash Severity Index	8.18	3.47	- 57.6 %
Volume	8,400	7,200	- 14.3 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	4	0	- 100.0 %
Class C Injury Crashes	11	1	- 90.9 %
Total Injury Crashes	16	1	- 93.8 %

The naive before and after analysis at the treatment location resulted in an 89 percent decrease in Total Crashes, an 89 percent decrease in Target Crashes, and a 56 percent decrease in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2007.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in an 89 percent decrease in both Total Crashes and 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.

Referencing the *Collision Diagrams*, the before period experienced a significant pattern of twenty-four (24) angle collisions from motorists who unsuccessfully attempted to cross SR 1117. After the signal installation, all angle collisions were eliminated at this intersection. The three (3) frontal impact collisions experienced in the after period were left turn-same roadway crashes from the permissive green signal phase. This countermeasure successfully corrected the crash occurrence at this location.

The calculated benefit to cost ratio for this project is **4.81 considering total crashes**. The benefit to cost ratio **considering only target crashes is 4.78**. 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 four 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



Looking North on SR 1105 (Turnpike Rd) – Showing Both Intersections



Traveling South on SR 1105 approaching intersection



Traveling West on SR 1117 (Blues Farm Road)



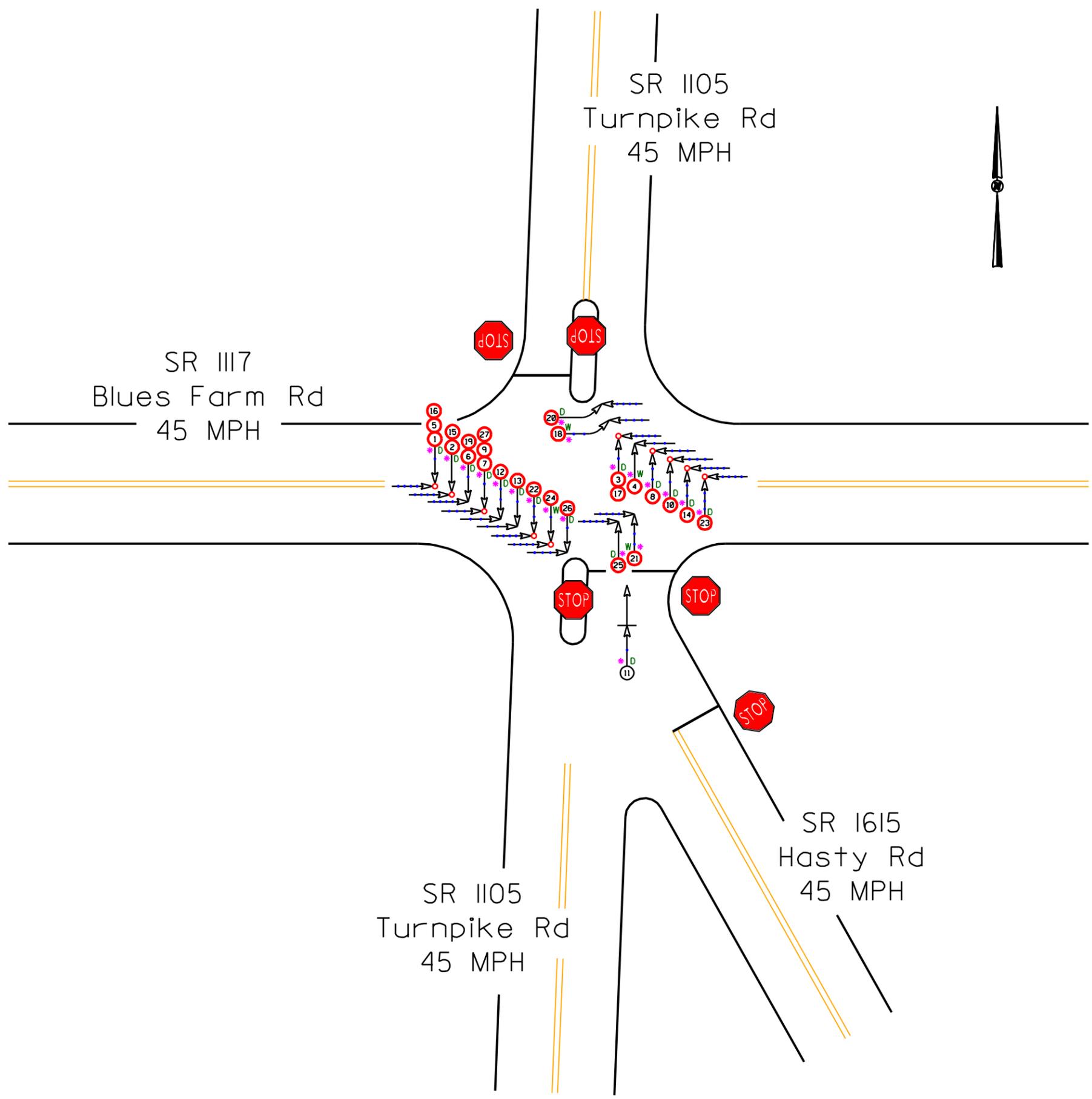
Traveling East on SR 1117

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: SR 1105 at SR 1117		BY: JBS						
COUNTY: Scotland		DATE: 2/3/2010						
FILE NO.: SS 08-02-207		NOTES: Total Crashes						
DETAILED COST:	TYPE IMPROVEMENT - Traffic Signal & Left Turn Installation							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$180,000	10	0.149	\$26,825				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$180,000	10	0.149	\$26,825				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,000				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$30,725				
TOTAL COST OF PROJECT=				\$180,000				
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	5.33	1	0.19	15	2.81	11	2.06	\$152,514
AFTER	5.33	0	0.00	1	0.19	2	0.38	\$4,841
Annual Benefits from Crash Cost Savings								\$147,674
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$116,948		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	4.81		
TOTAL COST OF PROJECT		-	\$180,000	COMPREHENSIVE B/C RATIO		-	4.81	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: SR 1105 at SR 1117		BY: JBS						
COUNTY: Scotland		DATE: 2/3/2010						
FILE NO.: SS 08-02-207		NOTES: Target Crashes - Frontal Impact						
DETAILED COST:	TYPE IMPROVEMENT - Traffic Signal & Left Turn Lane Installation							
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
Construction	\$180,000	10	0.149	\$26,825				
Right-of-Way	\$0	0	0.000	\$0				
TOTALS	\$180,000	10	0.149	\$26,825				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$3,000				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900				
TOTAL ANNUAL COST=				\$30,725				
TOTAL COST OF PROJECT=				\$180,000				
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	5.33	1	0.19	15	2.81	10	1.88	\$151,782
AFTER	5.33	0	0.00	1	0.19	2	0.38	\$4,841
Annual Benefits from Crash Cost Savings								\$146,942
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$116,217		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	4.78		
TOTAL COST OF PROJECT		-	\$180,000	COMPREHENSIVE B/C RATIO		-	4.78	



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	INJURY	50 MPH TO 59	ICY OR SNOWY
REAR END	FATALITY	60 MPH TO 69	OILY
RAN OFF ROAD		70 AND UP	
		SPEED UNKNOWN	

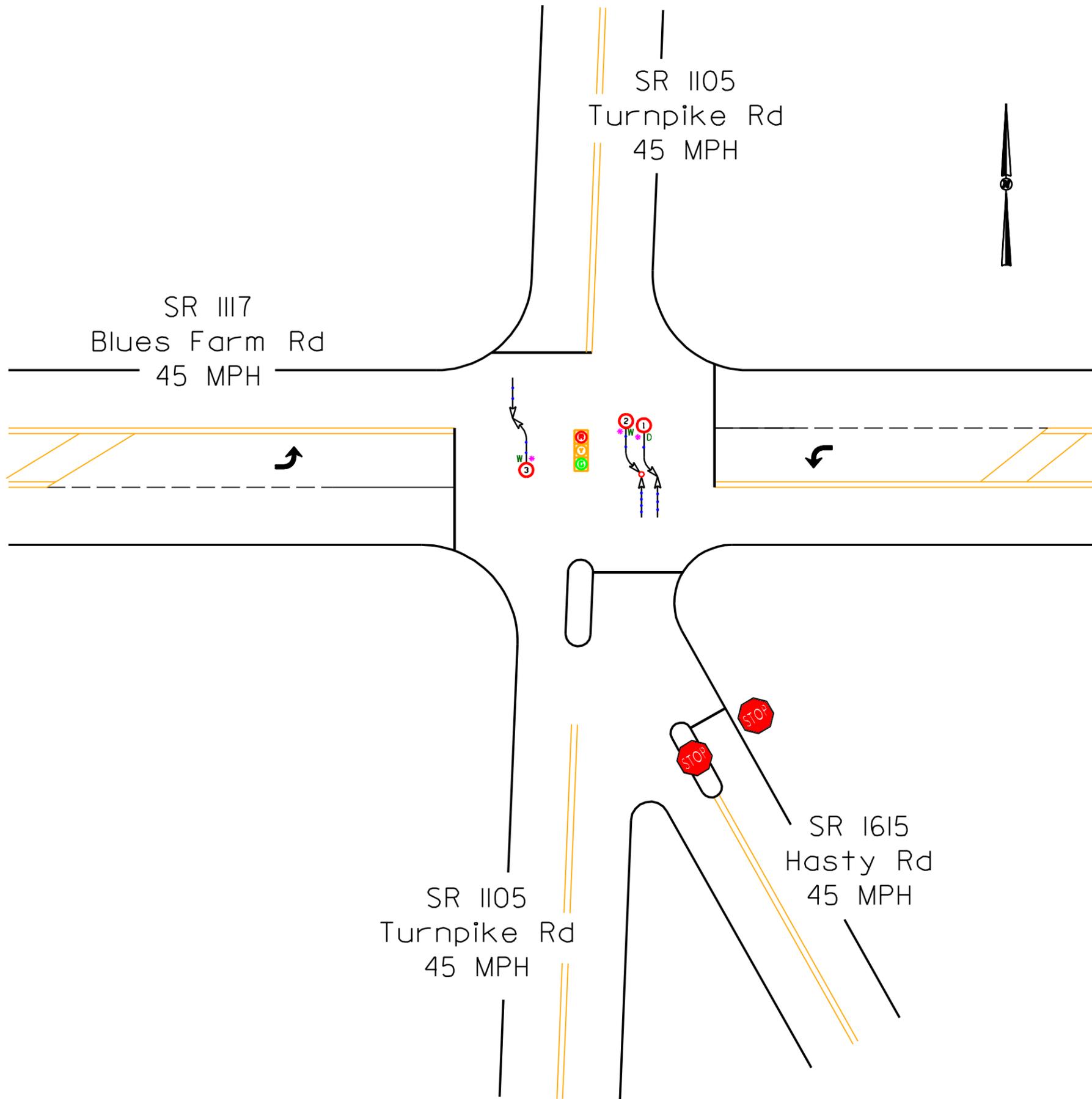
SS# 08-02-207
 Scotland County
 City of Laurinburg
 BEFORE Period
 2/1/99 - 5/31/04

Frontal Impact
 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: B	AREA:
	STUDY PERIOD: 2/1/1999 - 5/31/2004	
	DISTANCE: Y-LINE = 150FT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: N/A	
	DIAGRAM PREPARED BY: JBS	
	DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE		
DATE: 2-3-2010		
LOG NUMBER: SS* 08-02-207 BEFORE		

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



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		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		OILY

SS# 08-02-207
 Scotland County
 City of Laurinburg
 AFTER Period
 8/1/04 - 11/30/09

New Signalized
 Intersection
 Sig ID 08-0324

Frontal Impact
 Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

		COLLISION DIAGRAM	
		DIVISION: B	AREA:
		STUDY PERIOD: 8/1/2004 - 11/30/2009	
		DISTANCE: Y-LINE = 150FT	
		ANALYSIS PREPARED BY: JBS	
		ANALYSIS CHECKED BY: N/A	
		DIAGRAM PREPARED BY: JBS	
		DIAGRAM REVIEWED BY: ST	
		SCALE: NOT TO SCALE	
		DATE: 2-3-2010	
		LOG NUMBER: SS* 08-02-207 AFTER	

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