

# Spot Safety Project Evaluation

Order # 41000009470

Spot Safety Project # 09-05-206

**Spot Safety Project Evaluation of the Traffic Signal Installation  
SR 1004 (Stokes Ferry Road) at SR 2131 (Dunns Mountain Road)  
Rowan 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

11-18-2010

Date

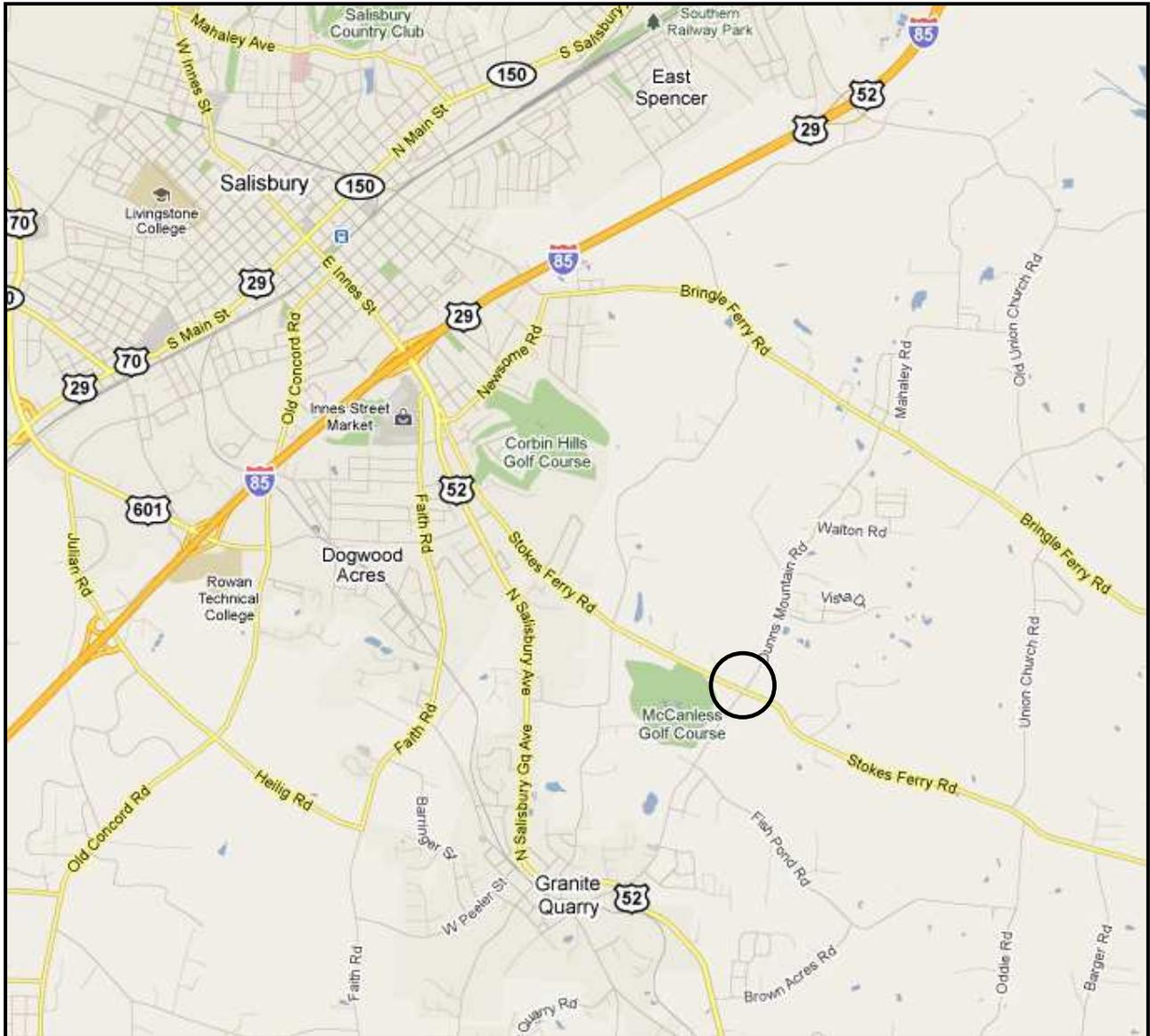
Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 09-05-206 located at the Intersection of SR 1004 (Stokes Ferry Rd) and SR 2131 (Dunns Mountain Road) in Rowan County, southeast of the City of Salisbury.

The Sig ID is 09-0848 for this newly installed traffic signal.





**Aerial Photograph showing Flasher Control Intersection  
Turn Lanes were not added with the Traffic Signal installation**

### **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 2-phase traffic signal. SR 1004 (Stokes Ferry Rd) and SR 2131 are both two-lane facilities at the subject intersection with speed limits of 50 mph and 45 mph respectfully. The subject location is a four-leg crossroads intersection, which was controlled by a stop condition on SR 2131 (Dunns Mountain Road) in the before period and had an overhead intersection flasher.

The original statement of problem was the existence of an angle crash pattern. It was determined that motorists were stopping for the stop sign on SR 2131 but pulling out in front of oncoming SR 1004 vehicles. The intended purpose of the new traffic signal was to alleviate the accident pattern by assigning travel right-of-way.

The initial crash analysis was completed from September 1, 1999 to August 31, 2004 with twenty-five (25) reported angle crashes, all of which were deemed correctable. The final completion date for the improvement at the subject intersection was on July 17, 2006 with a total cost of \$39,500.

## 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 April through July 2006. The before period consisted of reported crashes from February 1, 2002 through March 31, 2006 (4 years and 2 months); and the after period consisted of reported crashes from August 1, 2006 through September 30, 2010 (4 years and 2 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; Angle; and U-turn, same roadway.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	26	19	- 26.9 %
Total Severity Index	5.27	12.48	136.8 %
Target Crashes	22	14	- 36.4 %
Target Crash Severity Index	5.37	15.53	189.2 %
Volume (2004, 2008)	10,500	9,900	- 5.7 %

<b><u>Injury Crash Summary</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	2	200.0 %
Class B injury Crashes	3	3	0.0 %
Class C Injury Crashes	12	6	- 50.0 %
Total Injury Crashes	15	11	- 26.7 %

The naive before and after analysis at the treatment location resulted in a 27 percent decrease in Total Crashes, a 36 percent decrease in Target Crashes, but a 137 percent increase 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 a strong angle crash pattern of SR 2131 motorists choosing insufficient gaps while crossing SR 1004. There were sixteen (16) angle crashes, three (3) left turn same roadway collisions on Stokes Ferry Rd, one (1) left turn onto SR 1004, and one (1) u-turn collision. It appears from the speeds listed on the crash reports that the motorists were coming to a complete stop in accordance to the stop sign before the collisions occurred. There were also no severe injury (fatality or A-injury) crashes in the before period.

After the signal installation, frontal impact collisions decreased by 36 percent. The after period shows five (5) left turn permissive green collisions and one (1) u-turn crash. Also, there were seven (7) red-light run crashes during the analysis. Five (5) of the seven occurred with the at-fault driver traveling east / southeast on SR 1004 (Stokes Ferry Road). The after period also produced two (2) A-injury crashes which explain the negative benefit-cost ratio listed below.

The calculated benefit to cost ratio for this project is **(-30.84) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-30.72)**. 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 both SR 1004 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 East / Southeast on SR 1004 approaching SR 2131



Traveling West / Northwest on SR 1004 (Stokes Ferry Rd)



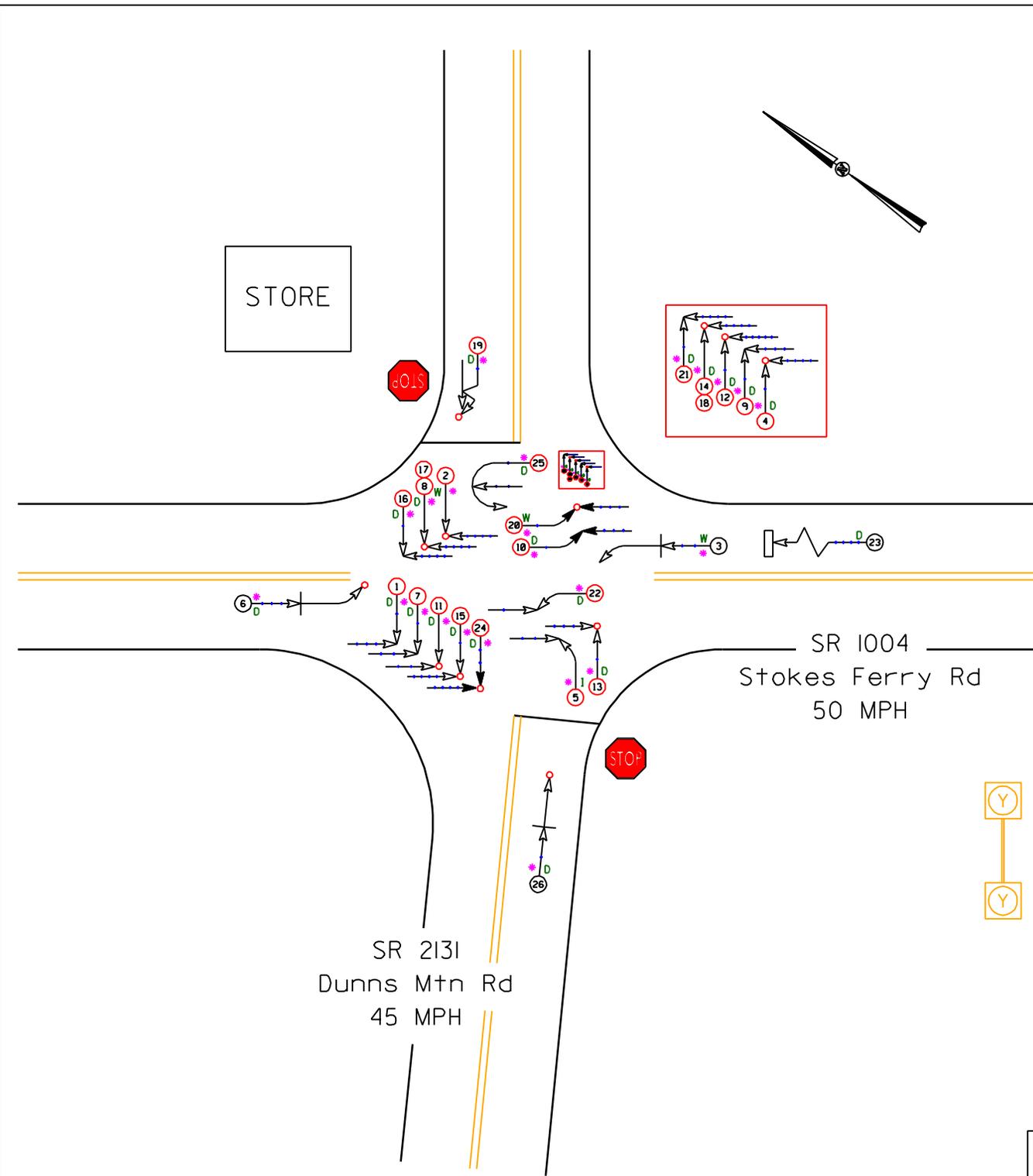
Traveling West / Northwest looking at intersection  
(Street-view not available for SR 2131)

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

LOCATION: SR 1004 at SR 2131		BY: JBS						
COUNTY: Rowan		DATE: 11/17/2010						
FILE NO.: SS 09-05-206								
DETAILED COST:	TYPE IMPROVEMENT - <b>New Traffic Signal</b>							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$39,500	10	0.149	\$5,887			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$39,500	10	0.149	\$5,887			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$8,787			
	TOTAL COST OF PROJECT=				\$39,500			
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	4.16	0	0.00	15	3.61	11	2.64	\$83,486
AFTER	4.16	2	0.48	9	2.16	8	1.92	\$354,423
								Annual Benefits from Crash Cost Savings (\$270,938)
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=			(\$279,724)
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=			-30.84
	TOTAL COST OF PROJECT	-	\$39,500	COMPREHENSIVE B/C RATIO	-			-30.84

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

LOCATION: SR 1004 at SR 2131		BY: JBS						
COUNTY: Rowan		DATE: 11/17/2010						
FILE NO.: SS 09-05-206								
DETAILED COST:	TYPE IMPROVEMENT - <b>New Traffic Signal</b>							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$39,500	10	0.149	\$5,887			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$39,500	10	0.149	\$5,887			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,000			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$8,787			
	TOTAL COST OF PROJECT=				\$39,500			
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	4.16	0	0.00	13	3.13	9	2.16	\$71,803
AFTER	4.16	2	0.48	7	1.68	5	1.20	\$341,707
								Annual Benefits from Crash Cost Savings (\$269,904)
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST				=			(\$278,691)
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST				=			-30.72
	TOTAL COST OF PROJECT	-	\$39,500	COMPREHENSIVE B/C RATIO	-			-30.72



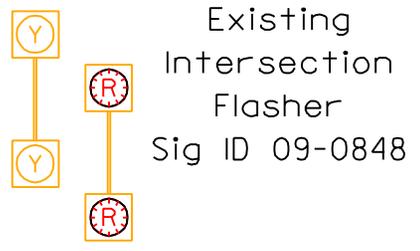
**LEGEND**

	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		SOBERSIDE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SHORRY
	REAR END		FATALITY		60 MPH TO 69		ICY OR SHORRY
	RAN OFF ROAD				70 AND UP		ONLY
					SPEED UNKNOWN		

SS# 09-05-206  
 Order# 41000009470  
 Rowan County  
 BEFORE Period  
 2/1/02 - 3/31/06

SR 1004  
 Stokes Ferry Rd  
 50 MPH

SR 2131  
 Dunns Mtn Rd  
 45 MPH



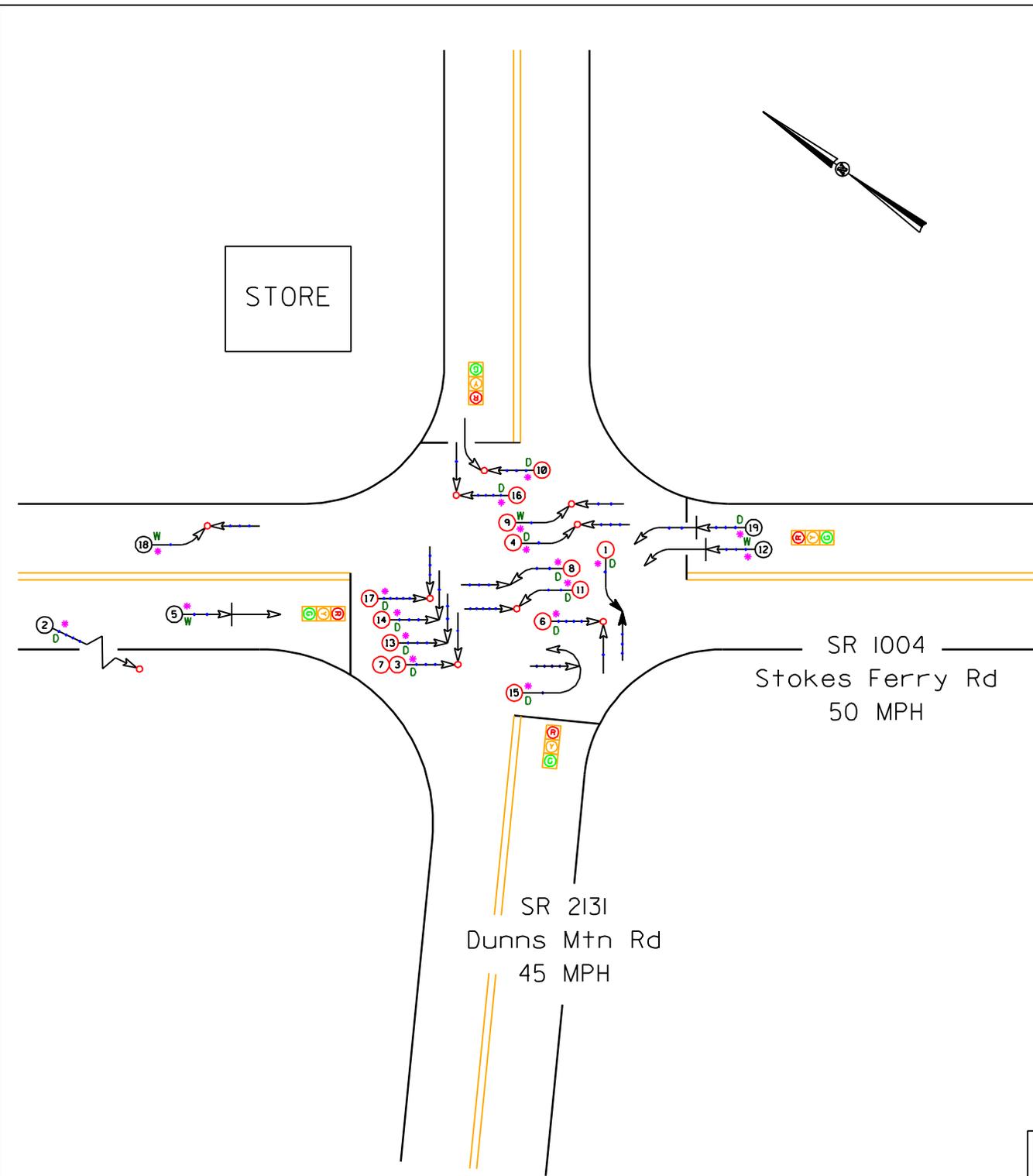
Existing  
 Intersection  
 Flasher  
 Sig ID 09-0848

Frontal Impact  
 Target Crashes

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

**TRAFFIC SAFETY UNIT**

Date: 11-16-2010      Prepared By: J. Schronce



**LEGEND**

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEOSTRIAN		TURNING		10 MPH TO 19		T TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		= DRIVER AT FAULT
	PAKED VEHICLE		SIDESWIPE		30 MPH TO 39		D DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W WET
	HEAD ON		INJURY		50 MPH TO 59		10 AND UP
	REAR END		FATALITY		60 MPH TO 69		I ICY OR SNOWY
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		O ONLY

SS# 09-05-206  
 Order# 41000009470  
 Rowan County  
 AFTER Period  
 8/1/06 - 9/30/10

SR 1004  
 Stokes Ferry Rd  
 50 MPH

SR 2131  
 Dunns Mtn Rd  
 45 MPH

New Signalized  
 Intersection  
 Sig ID 09-0848

Frontal Impact  
 Target Crashes

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

Date: 11-16-2010      Prepared By: J. Schronce